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1911 Robinson, Lady Maud, f.e.s., "Worksop Manor," Notts. *l, n.*

YEAR OF ELECTION.

1920 ROTHSCHILD, THE RIGHT HON. LORD, D.SC., F.R.S., F.L.S., F.Z.S., F.E.S., Tring, Herts. *l.* (*Life Member.*)

1887 ROUTLEDGE, G. B., F.E.S., "Tarn Lodge," Heads Nook, Carlisle. *l, c.*

1890 ROWNTREE, J. H., "Scalby Nabs," Scarborough, Yorks. *l.*

1921 RUGGLES, HY., 146a, Southfield Road, Bedford Park, W. 4.

1915 RUSSELL, S. G. C., F.E.S., "Roedean," The Avenue, Andover Junction, Hants. *l.*

1908 STAUBYN, Capt. J. S., "Sayescourt Hotel," 2, Inverness Terrace, Bayswater, W. 2.

1914 SCHMASSMANN, W., F.E.S., "Beulah Lodge," London Road, Enfield, N. *l.*

1910 SCORER, A. G., "Hillcrest," Chilworth, Guildford. *l.*

1922 SEABROOK, Lieut. J. C., F.E.S., 8, West Warwick Place, Belgravia, S.W. 1. *l.*

1911 SENNETT, Lieut. NOËL S., (R.N.V.R.), F.E.S., 43, Pembroke Square, Kensington, W. 8. *c.*

1923 SEVASTOPULO, D. G., 147, Gloucester Terrace, W.2. *l.*

1910 SHELDON, W. G., F.Z.S., F.E.S., "West Watch," Limpsfield, Surrey. *l.*

1898 SICH, ALF., F.E.S., "Corney House," Chiswick, W. 4. *l.*

1920 SIMMS, H. M., B.SC., F.E.S., "The Farlands," Stourbridge.

1903 SMALLMAN, R. S., F.E.S., "Hethersett," 30, Leigham Court Road, Streatham, S.W.16. *l, c.*

1921 SMART, Major, H. D., R.A.M.C., M.D., D.SC., F.E.S., "Shelley," Huddersfield. *l.*

1908 SMITH, B. H,, B.A., F.E.S., "Frant Court," Frant, nr. Tunbridge Wells. *l.*

1922 SETH-SMITH, D. W., 34, Elsworthy Road, N.W. 3. *l.*

1920 SMITH, S. Gordon, F.E.S., F.L.S., "Estyn," Boughton, Chester. *l.*

1890 SMITH, WILLIAM, 13, St. Mirren Street, Paisley. *l.*

1882 SOUTH, R., F.E.S., 4, Mapesbury Court, Shoot-up-Hill, Brondesbury, N.W.2. *l, c.*

1908 SPERRING, C. W., 8, Eastcombe Avenue, Charlton, S.E. 7. *l.*

1920 STAFFORD, A. E., 98, Cowley Road, Mortlake, S.W. 14.

1921 STANILAND, L. N., F.E.S., "Trewint," Coppett's Road, Muswell Hill, N. 10. *ec. ent.*

1872 STEP, E., F.L.S., 158, Dora Road, Wimbledon Park, S.W. 19. *b, m, cr; Insects, all Orders.*

YEAR OF ELECTION.

1916 STEWART, H. M., M.A., M.D., 123, Thurlow Park Road, Dulwich, S.E. 21. *l.*

1922 STOKES, C. H. H., 107, Queen's Road, Upper Norwood, S.E. 19. *ent. bot.*

1923 STOLZLE, G. A. W., 15, Benson Road, Forest Hill, S.E. 23. *l.*

1923 STOLZLE, R. W., 15, Benson Road, Forest Hill, S.E. 23. *c.*

1910 STONEHAM, Capt. H. F., F.E.S., M.B.O.U., 4th Battn. King's Rifles, Bomba, Uganda, B. E. Africa. *l.*

1911 STOWELL, E. A. C., B.A., Eggars Grammar School, Alton, Hants.

1920 SWIFT, R., "Cilmory," Knoll Road, Bexley. *l.*

1916 SYMS, E. E., F.E.S., *Council*, 22, Woodlands Avenue, Wanstead, E. *l.*

1920 TALBOT, G., F.E.S., "The Hill Museum," Witley. *l.*

1922 TAMS, W. H. T., F.E.S., 19, Sulivan Road, Hurlingham, S.W. 6. *l.*

1894 TARBAT, Rev. J. E., M.A., The Vicarage, Fareham, Hants. *l, ool.*

1913 TATCHELL, L., F.E.S., Swanage, Dorset. *l.*

1902 TONGE, A. E., F.E.S., *Hon. Treasurer*, "Aincroft," Grammar School Hill, Reigate. *l.*

1887 TURNER, H. J., F.E.S., *Hon. Editor*, 98, Drakefell Road, New Cross, S.E. 14. *l, c, n, he, b.*

1924 VALENTINE, A., Graud Hotel, Herne Bay. *l.*

1922 VALLINS, F. T., 372, Sherrard Road, Manor Park, E.12. *l.*

1921 VERNON, J. A., "Lynmouth," Reigate, Surrey. *l.*

1921 VESTERLING, A. W., 107, Castle Street, Battersea, S.W. 11. *l.*

1923 VREDENBERG, G., 38, Ashworth Mansions, Maida Vale, W.9. *l.*

1889 WAINWRIGHT, C. J., F.E.S., "Daylesford," Handsworth Wood, Birmingham. *l, d.*

1911 WAKELY, L. D., 11, Crescent Road, Wimbledon Common, S.W. 19. *l.*

1880 WALKER, Comm. J. J., M.A., F.L.S., F.E.S., "Aorangi," Lonsdale Road, Summertown, Oxford. *l, c.*

1920 WATSON, D., "Stewart House," 27, Overcliffe, Gravesend.

1922 WATSON, E. B., F.E.S., 85, Park Avenue, Ottawa, Ontario, Canada. *l.*

1911 WELLS, H. O., "Inchiquin," Lynwood Avenue, Epsom. *l.*

1922 WEST, A. G., Clive Road, West Dulwich, S.E. 21. *l.*

1920 WEST, W., 29, Cranfield Road, Brockley, S.E.

YEAR OF
ELECTION.

1911 WHEELER, The Rev. G., M.A., F.Z.S., F.E.S., "Ellesmere," Gratwicke Road, Worthing. *l.*

1920 WIGHTMAN, A. J., 35, Talbot Terrace, Lewes, Sussex. *l.*

1914 WILLIAMS, B. S., "St. Genny's," Kingscroft Road, Harpenden. *l, c, hem.*

1912 WILLIAMS, C. B., M.A., F.E.S., Ministry of Agriculture, Cairo, Egypt. *l, ec. ent.*

1923 WINDSOR, F. S., "Oatlands Cottage," Horley, Surrey. *l.*

1923 WINDSOR, P. H., "Fern Hill," Horley, Surrey. *l.*

1920 WITHYCOMBE, C. L., M.SC., F.E.S., West Indian Agricultural College, Trinidad, B.W.I. *l, b, n, mi.*

1918 WOOD, H., "Albert Villa," Kennington, near Ashford, Kent. *l.*

1921 WORSLEY-WOOD, H., 31, Agate Road, Hammersmith, W. 6. *l.*

1920 YOUNG, G. W., F.R.M.S., 20, Grange Road, Barnes, S.W. 13.

Members will greatly oblige by informing the Hon. Sec. of any errors in, additions to, or alterations required in the above Addresses and descriptions.

REPORT OF THE COUNCIL, 1923.

THE Council, in presenting the fifty-second Annual Report, is pleased to be able to state that the Society continues in a satisfactory condition. The membership is now 225, made up as follows:—195 Full Members, 20 Country, 6 Life, and 4 Honorary. The Council regrets to report there have been two deaths, *viz.*, B. W. Neave and W. H. Whiffen.

The Council regrets that a vacancy in its ranks was caused by the departure of Dr. Withycombe for Trinidad; but it congratulates him on his appointment, and looks forward to receiving communications and exhibits from him.

On December 13th, a Special Meeting was held, at which it was agreed to make a small increase in the Subscriptions of all denominations to meet the increase of rent of the Society's meeting rooms.

A Special Exhibition of Orders other than Lepidoptera was held on September 27th, and was a decided success.

The Annual Exhibition was held on November 22nd, and although there were not so many exhibits as on former occasions, many of the exceptional forms of *Polyommatus* (*Agriades*) *coridon* from Royston and of *P.* (*A*) *thetis* taken this year, were exhibited, also some of the striking varieties of *Argynnis paphia* obtainable from the New Forest, among many other interesting items.

Mr. Dennis has again officiated as Hon. Lanternist. Papers have been read before the Society by the Rev. J. Waterston, Dr. H. S. Fremlin, Col. Rattray, Messrs. S. H. Ellis, W. H. J. Prior, R. Adkin (two), O. R. Goodman, T. H. L. Grosvenor, and Hugh Main.

Lantern slides were shown on some of these occasions.

The Honorary Curator reports that during the past year numerous additions to the Society's Collections of British Lepidoptera have been made by Messrs. R. Adkin, A. A. W. Buckstone, F. A. Parker, etc. Mr. H. Moore gave a beautiful dark form of *Arctia caja*, and Mr. H. Candler presented South African butterflies, which he had collected at the Cape.

The Honorary Librarian reports that the Library still mantains its usefulness both as regards use for reference and the number of books borrowed.

Field meetings were held at Ranmore Common, Westerham, Caterham, Canvey Island, Princes Risborough, and Ashtead (Fungus Foray).

Mr. R. Adkin was the Society's Delegate at the meeting of the Representatives of the Corresponding Societies of the British Association in Liverpool in September.

Messrs. Stanley Edwards and H. J. Turner were the Society's Delegates at the Congress of the South Eastern Union of Scientific Societies held at Maidstone in June.

The volume of Proceedings published late in the year, consists of xviii. and 152 pages with eight plates, and is the most imposing the Society has produced.

The following is a list of the additions to the Library during the year by exchange unless otherwise stated.

Books.

"Fauna of Hawai, Microlepidoptera" (A. E. Tonge); "N. American Wildfowl"; "Monograph of the Opalinid Ciliate Infusorians"; "N. American Bryozoa" (U.S. Mus.); "Papillons d'Europe, Ernst and Engramelle" 8 vols. (R. Adkin); "Seitz Macrolepidoptera, vol. 3 Pal. Noctuae and vol. 4 Pal. Geometers" (O. R. Goodman); "Photography, Spitta" (A. E. Tonge); "Mayflies" (U.S. Mus.); "Caddisflies" (U.S. Mus.).

Magazines and Periodicals.

"Entomologist"; "Entomogist's Monthly Magazine"; "Entomological News"; "Irish Naturalist"; "Essex Naturalist"; "Canadian Entomologist"; "Notula Entomologica"; "Entomologiska Tidskrift"; "Entomologische Mitteillungen"; "Philippine Journal of Science"; "Vasculum"; "Zoologiska Bidraga, Uppsala"; "List of Additions to the U.S. National Herbarium."

Reports and Transactions of Societies.

Annales et Bulletin Société entomologique de France; Report of the Conference of the Delegates of Corresponding Societies of the British Association; Proceedings and Transactions of the Croydon Science Society; Annual Report of the Smithsonian Institution; The London Naturalist; Transactions of the Wisconsin Academy of Science; Transactions and Proceedings of the Perthshire Society of Natural Science; Report of the Progress of the U.S. National Museum; The Hastings and East Sussex Naturalist; The S. Eastern Naturalist (S.E.U.S.S.); Chicago Field Meetings of Natural History;

Proceedings of the U.S. National Museum; Proceedings of the Bournemouth Natural Science Society; Report of the Lancashire and Cheshire Entomological Society; Bolletino R. Scuola d'Agricoltura, Portici, Italy; Proceedings of the Isle of Wight Natural History and Science Society; Transactions of the Carlisle Natural History Society, vol. iii.; Transactions of the Leicester Literary and Philosophical Societies; Transactions of the Entomological Society of London, many vols. (Dr. Fremlin); The Rochester Naturalist.

Pamphlets and Separates.

"Review of N. American *Eucosmidae*"; "Catalogue of Indian Insects, pts. 2 and 3"; "List of publications on Indian Entomology"; Separata from Prof. T. D. A. Cockerell, Dr. Withycombe, and others.

TREASURER'S REPORT, 1923.

I am pleased to report that the finances of the Society continue in a healthy condition, our regular income showing an increase of about £10 compared with 1922.

Unfortunately the landlords have doubled the rent payable for the use of our meeting rooms from January 1st, 1924, and, in order to raise the £25 required to meet this, your council decided to increase all subscriptions by the minimum amount necessary, namely half a crown. This should produce sufficient to cover the advance, and I sincerely hope it will not be found necessary to make any further increase, as I regard it as a very important point for a society such as ours to keep the amount of the annual subscription at the lowest figure it is possible to carry on with.

I shall hope for a large increase in the membership during the coming year, and for some reduction in the cost of printing the Proceedings, which will materially help to improve our financial position, and I am still awaiting the receipt of the £200 left to us under the will of our late member Mr. Lachlan Gibb, which I mentioned in my last report; but if we spend more than about £60 on printing I fear it will continue to be necessary to ask for donations to the Publication Fund.

During the last year our regular expenses, printing excepted, were about the same as usual. The printers bill however, was easily a record, and nearly double the amount we paid in 1922, £101 18s. 7d. against £51 18s. 4d. Fortunately members rallied to my assistance in really magnificent fashion, and the donations to the Publication Fund were a record too, amounting altogether to the substantial sum of £54 10s. 1d.

Arrears of subscriptions paid during the past year were rather more satisfactory, being £4 15s. more than in 1922, and £2 15s. in excess of my estimate in the last balance sheet. Entrance fees also were slightly increased.

Sales of apparatus and duplicate books from the Ashdown bequest produced £7 4s., which, with the entrance fees £3 5s., have increased the balance to credit of suspense account by about £10. The sum so far realised by the sales under this bequest amounts to the very satisfactory figure of £23 9s. 7d.

The librarian has disposed of some of the surplus parts, which were taking up valuable space, for the sum of £4, and this has improved the balance to credit of the library fund, in spite of a slight increase in our bill for bookbinding.

There are again a large number of members who have not yet paid their subscriptions for 1923, and I shall be glad to hear from them as quickly as possible; I would also ask those who read this to be good enough to remember the increase of 2s. 6d. when sending me their contributions for 1924, the only notification sent out having been included in the circular announcing the annual meeting, and seems to have escaped attention in some instances.

The Balance Sheet shows that the surplus of assets over liabilities has increased during 1923 by £20 7s. 5d., and now stands at £168 12s. 4d. The sum invested is exactly as shown in the previous accounts, but has depreciated a little in value owing to the state of the stock markets.

My best thanks are due to those members who have so kindly contributed to the donations list, and to the Officers and Council for their help and direction during the past twelve months.

The accounts in detail, which have been very carefully checked and passed as correct by your auditors Messrs. T. W. Hall and F. B. Carr, are as follows:—

THE SOUTH LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.

STATEMENT OF ACCOUNTS FOR THE YEAR 1923.

REVENUE ACCOUNT.

Expenditure.		£ s. d.
To Rent	25 0 0	
,, Fire Insurance	1 6 6	
,, Attendance	2 10 0	
,, Oxygen etc.	1 1 2	
,, Hire of chairs	1 0 6	
		30 18 2
,, Subscriptions:—		
South-Eastern Union of S. Societies	15 0	
Footpaths Preservation Society	10 6	
		1 5 6
,, Postages, Stationery & sundries:—		
Secretaries	10 5 0	
Treasurer	19 9	
		11 4 9
,, Entrance fees to Suspense a/c		3 5 0
,, Vote to Publication Fund		45 0 0
,, Balance		20 8 3
		£112 1 8

Income.		£ s. d.
By Balance brought forward		13 2 8
,, Subscriptions:—		
Current	68 1 0	
Advance	12 8 0	
Arrears	10 5 0	
		90 14 0
,, Entrance fees		3 5 0
,, Dividends		5 0 0
		£112 1 8

ENTRANCE FEES AND LIFE-MEMBERSHIP SUBSCRIPTIONS ACCOUNT.

	£ s. d.
To Balance	36 17 3
	£36 17 3

	£ s. d.
By Credit Balance brought forward	26 8 3
,, Entrance fees	3 5 0
,, Sale of Books and Cases of Ashdown Bequest	7 4 0
	£36 17 3

LIBRARY FUND.

	£ s. d.		£ s. d.
To Andrews—Binding ..	2 18 6	By Balance brought forward ..	18 0
,, Balance ..	2 1 10	,, Fines ..	2 4
		,, Sale of surplus parts (Wesley) ..	4 0 0
	£5 0 4		£5 0 4

PUBLICATION FUND.

		£ s. d.		£ s. d.
To Cost of Blocks ..	11 14 7		By Balance brought forward ..	16 0
,, Printing Proceedings ..	90 4 0		,, Donations ..	54 10 1
		101 18 7	,, Sales of Proceedings ..	3 7 6
,, Balance ..		1 15 0	,, Vote from General Fund ..	45 0 0
		£103 13 7		£103 13 7

BALANCE SHEET.

Liabilities.	£ s. d.	*Assets.*		£ s. d.
To Balance, being excess of assets over liabilities ..	168 12 4	By Balances—		
		,, General Fund ..	20 8 3	
		,, Suspense a/c.. ..	36 17 3	
		,, Library Fund ..	2 1 10	
		,, Publication Fund ..	1 15 0	
				61 2 4
		,, Investments at Cost:—		
		£100 of 5% National War Bonds ..		99 10 0
		,, Subscriptions in arrear:—		
		Good ..	8 0 0	
		Doubtful ..	7 0 0	8 0 0
	£168 12 4			£168 12 4

We have examined the above Balance Sheet with Stock Certificate for £100 War Loan, receipts and vouchers, and find the same correct, this 19*th January*, 1924.

T. W. HALL,
F. B. CARR, } *Auditors.*

St. Kilda.*

By James Waterston, B.D., D.Sc., F.E.S.—*Read February 8th, 1923.*

With the exception of the more outlying and uninhabited islet of Rockall, St. Kilda is the most isolated spot in Britain. Some of the many contributary causes to this result will be later indicated, but at first sight it is surprising that an island only 36 miles from the comparatively busy life of the Outer Hebrides and by which vessels, especially traders and fishing-craft, continually pass, should be so completely apart, that for six months of the year its only visitor may be a storm-stayed trawler, its only communication with the outside world through letters tied in a bladder and committed to the waves and winds†. Yet in spite of, or perhaps because of, the charm of its inaccessibility, St. Kilda has been more written about for a couple of centuries than any other place of equal importance. Its scenery, industries, people, customs, flora and fauna have been described or noted in so many scattered papers and monographs, that to attempt a complete Bibliography now would be no easy task. I feel certain, too, that such notices cannot be confined to our language, but that many of the foreigners, who from choice or necessity have sojourned in St. Kilda, must have been struck by its many peculiarities.

It may conduce to clearness, if before going further, I indicate briefly the position and dimensions of the place. I have spoken of St. Kilda as if it were one island. In reality it is a group of four—Hirta, Boreray, Soay and Dun, together with their stacks—but it is of the first, the largest, of these principally that I shall speak to-night. Roughly it lies 30 to 40 miles west of the Sound of Harris, with a coastline of 10 miles, a breadth of $2\frac{1}{4}$ and a length of $2\frac{1}{2}$ miles.

At a time geologically recent the mainland of the continent stretched westwards for some 200 miles beyond the present coast-line of Uist and Lewis, forming a low plain with here and there

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* Recollections of two visits paid during 1905 and 1906. On the former occasion the writer stayed a month on the island.

† I sent off three such "Mails" in all. The first reached the W. shore of N. Uist. The second travelled over 200 miles to the Shetlands, where it came safely to land. The contents of these two mails were duly delivered. The third mail was lost.

hills of igneous rock. But for a long time a gradual subsidence set in, with the result that now the plain has become a shallow sea—its mountains solitary precipitous islands, windswept and weatherworn. This explains in part how Hirta rises so abruptly from the sea. There is only one landing place and one safe anchorage for vessels of any size—Village Bay on the S.E. On the N.W. again the land slopes more gradually to the water, but there is no landing place. For the rest, Hirta is girt by a rampart of cliff seldom less than 100 feet, running for long stretches 600 feet above the waves, and culminating behind Conacher in a great precipice of 1,200 feet. It takes one a long time to become accustomed to the magnitude of these grand sea walls, and often in the evening approaching land from the east their shadows close over a rowing boat while they tower above. You get a curious impression of nearness only dispelled by the long subsequent row.

Until a few years ago it must have been a serious business even to get to Hirta. From the time of Martin, 1697, down to the Journeys of Sands, 1873-6, it seems to have been customary to hire, provision and man a special vessel. Nowadays the voyage is a comparatively easy matter during the summer months, when two Glasgow companies have fortnightly runs to the island. Even so, however, landing is impossible in a S.E. gale, and often the boats make their journey only to go the round of the island and return. From the mainland small boats hardly ever venture, though the Uist men make autumnal raids on a seal rookery on the Heiskeirs, a group of rocks about halfway across. I suspect that there is, or was, little love between the islanders; a common threat to unruly children in Uist and Skye is banishment to St. Kilda. It has been said, too, that the St. Kildians were originally convicts from the mainland, but there seems to be no ground for this, unless perhaps the desire to give point to some hard saying.

Like Martin, I was under a deep debt to the Steward of St. Kilda during my visit. Mr. McKenzie told me his house was at my disposal for a month, but that I should have to take everything with me. The elasticity of this last word did not dawn on me till I was as far on my way as N. Uist, where I finally realised that stores would have to be taken, and all the cooking done by myself. From the west coast of this island St. Kilda is plainly visible on any clear day, and for nearly a fortnight it lay dim and shadowy on my horizon. In the morning you saw a faint outline, long and low-backed, of the main island, with an intervening stretch of water, then the abrupt cap of Boreray. At midday both stood out sharp and grey, but as evening stole on this was replaced by a blue tint ever deepening, till when sunset flooded sky and sea, they lay for an instant like some great stones in a setting of gold, then vanished.

At last, on June 10th, I joined the 'Dunara' at Dunvegan, and by the afternoon we had skirted Skye, crossed the Minch and passed the Sound of Harris. About a couple of hours from our destination we sailed into the rearguard of the great army of birds that nightly roost on these islands. Farthest out came the fulmars with their tireless soaring flight; then puffins, razorbills and guillemots hurrying landwards in continuous lines. Gannets were rarer, floating high above their neighbours, and every now and then shooting like a bolt into the sea and rising again with a listless flapping flight curiously at variance with their former sudden energy.

The captain did not bring us at once to anchor, but spent over an hour sailing round Boreray and Soay. The foghorn went incessantly, raising thousands of birds from roost or nest, and as we went on, ledge and slope added their complement, till the air was filled and darkened. At a distance it seemed a misty veil thrown from the cliffs, and when you passed through, you were in the midst of a titanic snowstorm—and every flake a bird. As we passed Soay, dusk began to fall and we steamed in silence around the shadowy Dun into the calmer waters of the Bay. A trawler rolling lazily on the swell caught the eye. Further inshore lay a solid jetty of cement, flanked on both sides by forbidding looking rocks. In the curve of the bay gleamed a narrow belt of sand in front of a confused wall of rounded boulders. These rounded stones, often of great size, are cast up by the winter gales, which also sweep away the sand. It was on this sand, according to older writers, that the St. Kildians held their games and practised on the fife—long since things of the past.

The land rises abruptly from the bay like an amphitheatre. Just at its base, separated from the shore by a few cultivated patches, lies the single streeted village in a crescent. At the S.E., within reach of the spray, lie manse, church and school. Farther up is the building annually occupied by the factor and proudly called by the inhabitants "The Big House." Then follow 16 small cottages, the dwelling-houses, substantially built and slate roofed, while there still appear some of the older houses with mud floor, dry stone walls cemented with turf and mud, and covered with turf and straw. These are used as stores, but one is still inhabited.

In answer to the "Dunara's" whistle a troop of dogs, several from each house, tore down the pathway to the pier, at the end of which they yelped and barked, rolling over one another in excitement. After an interval one man appeared, then another, then a third strode across a field, hands in pockets. The three met, held a leisurely discussion, and finally turned their faces towards the boat. Slowly a knot gathered at the pier and later a barge crowded with men and boys came out to sell socks, cloth, and eggs. Meanwhile a dinghy had put off from the trawler, and in it sat a man to whom I had a letter of introduction. No sooner had we reached the pier than I had my first experience of a custom soon to be very familiar. In St. Kilda you shake hands with everybody in every place and at every time. You get up in the morning and in the course of a stroll, thus exchange greetings with half the population. The only circumstances in which a man does not hold out his hand is when it is blood-smeared or dirty, *e.g.*, after cleaning fish, and then he is always ready to apologise with a smile for the omission of the ceremony. After tea my friend got the key of the Big House and we proceeded to inspect it. It consists of two stories with a couple of rooms on each flat. The lower rooms felt cold and were in use as a store, but the two upper ones I quickly decided to use, one as living-room, the other as laboratory. They had, of course, to be cleaned out, and it may interest you to know that the girl whom the headman sent to do this, used as a brush a gannet's wing cut at the first joint. My arrangements thereafter were simple; a hammock slung below the roof was my sleeping place, a table and chair completed the furniture, while later I had the additional luxury of a soap box divided by partitions, and fixed to the wall for the bestowal of sundry necessaries.

It is hardly possible in the limits of a short paper to give an outline of my life for the next month, even if that were likely to be interesting. The time was in the main occupied in making a survey of the animals and plants of the island, and I shall endeavour before closing to put before you some of the more outstanding features in as untechnical a way as possible. Meanwhile it may be of interest to describe the people, and some of the incidents of island life.

The natives of St. Kilda are somewhat below the average in height, and that appearance is increased by the stoutness of their build. Both men and women are strongly though hardly symmetrically developed. In consequence of their cliff limiting the frequent bearing of heavy weights, their carriage is not very erect and the lower leg is uncommonly thick. I think it was Mr. Kearton who first drew general attention to their large ankle bones, which are noticeable even in children of a few years. These bones project widely for the attachment of ligaments and the greater support thus given to the body reduces to a minimum, the swaying tendency which in traversing steep rock faces or narrow ledges is far more dangerous than any lack of nerve. There are two fairly well-marked types, one dark-haired, brown with much exposure, and in the women at least showing very regular features. And here I quote a remark of Martin. "Several of them would be reckoned among beauties of the first rank were they upon a level with others in their dress." A second type is the face and hair of much lighter colour. As to their origin, there seems to be considerable doubt. That they have been long settled on the island is clear from the remains which go back to Viking times. In 1724 smallpox swept away the greater part of the population and the story is perhaps worth telling. There were at the time about 25 families on the island and the population cannot have been much under 180, the number given by Martin in 1697. A native of Hirta who had settled in St. Kilda went on a visit to his friends, and there died of smallpox. His clothes were sent back to Hirta and in a community from its long isolation peculiarly subject to an epidemic, rapidly spread disease. 20 families were wiped out and of the surviving 5, only 4 adults and 26 orphans remained. 3 men and 8 boys escaped in a remarkable way. Just before the smallpox began in August, they had been sent across to Stack-An-Armin to catch gannets for the benefit of the community. They were detained some time by their work and when the time arrived for sending a boat to pick them up there was not a crew of sound men on Hirta. So they remained all the winter until relieved by the Factor's boat in the spring. That they survived at all was a triumph of resourcefulness and hardiness, for by the end of September practically all the birds leave the rocks. One man it is said had a nail which he fashioned into a hook, and enabled the men to catch fish when their supplies failed.

From the survivors on Hirta and the men and boys who wintered on Stack-An-Armin, the present population is descended. One can see this in the family names M'Queen, Gillies, McCrimmon, M'Donald and M'Kinnon. There are also to be added several Fergusons, but they have settled since the outbreak of 1724. At present the population is as it has been for the past 30 years, about 70, of which nearly one third are children. Of course everyone knows that within 20 years of the present time the infant mortality of Hirta was excessive. The older writers are full of it. It was a form of tetanus, and no child was safe during the first fortnight of its existence. Improper feeding and ignorance were contributory causes, but lack of cleanliness was undoubtedly the chief factor in the shortening of so many young lives. It is somewhat saddening to think of this needless waste and the lack of simple remedies now in force. The pursuits followed by the St. Kildians vary somewhat now from of old. In the beginning of the 17th century, agriculture flourished and Martin tells us their barley was the best grown in all the Western Isles, and describes the care shown in attending to their fields. Nowadays oats and potatoes are the only crops, though the land seems capable of better things. Such corn as is grown is in small patches in front of the houses—often not more than three yards square. It is of poor quality, weed-choked, short in the straw, and perhaps only sown for that. I saw no attempt to cultivate vegetables or flowers anywhere, and as for the manse garden, it was almost bare this year owing to a seedsman having neglected an order. As agriculturalists then one cannot take the St. Kildian's seriously. Their wealth, such as it is, lies in their flocks of birds. There are about 1,000 sheep on Hirta and others are kept on Boreray. At certain seasons of the year the rams are taken across to Dun and sometimes also the lambs. The people have rather an ingenious way of securing a supply of fresh soft grass for young or weakly animals. In several places they have constructed square and circular pens singly and in groups which on the slope of Bernahaig form a curious pattern. The shelter of the pen walls check the winds so that inside one finds a luxuriant growth which contrasts markedly with the short bent of the hillside. These St. Kilda sheep are small in size reminding one of the ponies seen in Shetland. The wool is short and fine and for it alone the sheep are kept. I was unfortunately unable to see the process by which the wool is removed from the sheep's back, but I believe it is taken partly by plucking and partly by cutting with a knife. In the spring the ewes are milked and the milk is used for the preparation of cheese. This very old practice was of course over by June but I was frequently offered the pale coloured cheese.

The whole process of cloth manufacturing from plucking to weaving is carried on in the island. Until recently all the dyes employed were the produce of the island, heather, lichen, etc., being used for this purpose, but with increased demand for the cloth came the wish for greater variety of colours to meet which various chemicals are now used.

Any day as one passes along the village, one may see women or girls wool-carding. In each hand is held a carder—an oblong piece of wood on one side closely set with perpendicular pieces of wire about ½″ in length. At one end is fixed the handle and the whole looks not unlike a currycomb. A handful of wool is taken and placed between the carders, which are then worked rapidly across one another alternately. A few minutes suffices to transfer the irregularly matted wool into a long cigar-shaped mass with all the strands lying in the direction of the long axis. If you pull such a mass gently from one end it comes away in a continuous thread, which, however, easily breaks. This is of course remedied in the twisting imparted by the spindle, the essential factor of the next process, the spinning. Carding and spinning occupy the women for the spare time of the summer, but when the sea has become too rough for fishing and the requisite number of fulmers have been salted, the men begin to weave. At this they sit all day and, so I was told, the greater part of the night. At intervals the women rise and prepare food, then work begins again. In the forenoon the men rest for a couple of hours, but are soon back to the loom and the work goes on as before. The output of cloth from St. Kilda steadily increases. This year about 100 pieces of 30 yards each were produced. It is a bluish grey rough spun tweed of the class known as "Harris." At St. Kilda it fetches from 2s. 11d. to 3s. 6d. per yard. At the latter price a good deal is sold to tourists and yachting parties.

Of course some of the cloth is retained for home use; here there is a somewhat anomalous thing, *viz.*, that the men do all the tailoring. Not only their own, but their wives and children's clothing are made by them. Luckily the standards are not exacting. It is only at St. Kilda that a young lady would appear in a costume giving one the same ample proportions from shoulder to foot. I believe that the modus operandi, *e.g.*, in the making of a skirt, consists in cutting a certain length from a web of cloth whose breadth is the length of the desired garment; then the ends are sewn together forming a broad cylinder. Finally the top is gathered together in some mysterious way round the waist in a creation simple, effective, and solid.

But if men here invade a province strictly not their own (at least in a primitive community) the women more than make up for it in their constant drudgery at tasks elsewhere given to men. They have the usual housework that everywhere falls to their lot, but here they do not magnify their office. Rather they despise it nor can one wonder at this if the number of other tasks done is considered. You hardly ever see a St. Kildian woman without a sack—she is on her way to fetch in some peat or rather turf, for that is what they burn. Now beyond the flat land at the village and West Bay already referred to, the slope of St. Kilda is in general like that of a house roof. The turves are cut and stored in cleits all over the hill tops, so that to get the daily supply of fuel may involve a climb of a mile or more, and one journey rarely suffices. There are, too, less than a score of cattle pastured on the West Bay about two miles from the village. Yet though the grass there is richer, it is insufficient in the opinion of their owners. So twice a day when the cows are milked, the women carry a supply of soft grass and docken leaves which they spread on the ground. As the cow eats the woman milks. The path to the glen rises over 700 feet in half a mile, and as the women descend almost to the level stretch at West Bay, this daily milking involves four times a climb nearly as great as that from Holyrood to the top of Arthur's Seat. The tender leaves given at those times to the cows, may be got near the village, but frequently have to be gathered from ledges a hundred feet or so down the cliffs, and these cannot be reached along the shore—for there is none. You must first climb to the top of the island and further climb down. A picture then that persistently clings to my mind, is of the woman bent under a load of peats or grass, passing along the hillside and knitting as she goes.

Formerly St. Kilda possessed a breed of horses, but these have passed away. The group, however, is unique in possessing a herd of true wild sheep, 300 to 400, on the island of Soay. These belong to the proprietor, and for the nominal fee of 2s. 6d., the natives are allowed to kill one if they can. The dogs are employed in this work, but as their only idea seems to be to run down an animal and seize it by the ear or throat, a common end to a sheep hunt is a wild bound of the hunted and a gathering of the mutton at the foot of a precipice. Soay is very difficult of access, and though the weather was fine, the men landed on it only once during my stay. Four or five sheep were taken, some alive. The meat was delicious and juicy—perhaps a mixed diet of seafowl and tinned meat sharpens one's appreciation.

While weaving is the staple industry, fowling takes up most of a St. Kilda man's time and is certainly first in his affections. The cliffs are divided into sixteen lots corresponding to the houses, and rights are carefully guarded. On the subsidiary islands, however, anyone can fowl where he pleases. The bird chiefly taken is the fulmar, one of the petrel family. At first sight it looks not unlike a gull, from which group, however, it is widely separated. It belongs to a very old stock in the bird kingdom, one of the chief evidences for this being the position of the nostrils in a tube running some little distance along the top of the upper fork of the bill. The fulmar is killed first and foremost as an article of diet, for which it is taken in summer almost every day, while in the autumn a great raid is made on the young when about to leave the nests. It is at this time also that the oil is collected. For days the village is fluffy with down and feathers, while the smell of oil is all pervading. The men when killing young fulmars endeavour to surprise their victims before the latter have time to discharge any oil at them. The bird is seized, its neck quickly twisted, and when a sufficient number have been got they are taken to the cliff top, where women, girls and smaller boys quickly invert the birds over jars, tins, etc., and gently squeeze the oil out. It is used as an illuminant (though less so now than formerly), as a dressing for bruises, etc., and to some extent taken with food. It has an absolutely nauseous smell to a stranger, though this dislike is gradually overcome—a good thing for anyone making a stay on the island. Fulmar oil has one peculiar property, *viz.*, that when dropped on cloth, leather, etc., it forms merely an evanescent stain. The black mark disappears in a few hours, the reason being that the oil has penetrated through every fibre of the cloth—and of course the smell also.

Besides the fulmar, many other species are taken, and of these the most important are the puffin, the guillemot, the gannet and the razorbill, in the order named. In the spring the guillemot is fowled in an ingenious and daring way. The fowler on some dark stormy morning just at daybreak, having been lowered over the cliff some time before, takes up his position on a ledge frequented by the birds. He is clothed in a white sheet, thus harmonising with the surroundings. With the first streaks of light, birds begin to arrive from the sea, and, mistaking the fowler for part of the cliff, they alight on his person and are instantly killed. The first dead birds he suspends from his waist, turning their breasts outwards, so that the incoming birds seem to see a row of their friends sitting on the rocks. As the light grows clearer the birds avoid the fowler, but in a short time he has been known to kill 50 or 60 of them.

The usual method of snaring these and other seafowl is by means of the fowling rod. To a stoutish tapering rod of deal or other light wood, from 12 to 16 feet long, there is attached a curved cane some 20 to 30 inches long. It also is slightly tapered. At the thin end is fitted a strong stiff cord of plaited quills which are gradually blended with horsehair, the whole ending in a permanent noose of that material. The aperture of the noose can be adjusted by a simple movement of the fingers. There are two ways of using this rod. First, on the cliffs, one scrambles down as far as possible in the quarry's direction, getting roped up to the man above when the first bit of real precipice is encountered. At this stage, the rod has to be carefully watched, as the slightest jerk against the rock may snap it. When within fowling distance the noose is adjusted, then foot by foot it is slowly approached to the bird's head, over which in the hands of a skilled manipulator, it quickly drops.

On the grassy slopes where puffin are snared, the modus operandi is different. You walk up to within seven or eight yards of the birds and sit down. Then you have to speak to them or otherwise occupy their attention. The rod, held hitherto end on to the birds, is now lowered to the ground and pushed towards them. If this be done without vibration the puffin stands motionless. The use of the curved piece of cane, now is evident, as it keeps the noose expanded about six inches from the ground. When opposite the puffin's head, the noose is deposited on its neck by a single turn of the wrist.

But to speak of the fowling or open air life begins an endless subject. One's thoughts recur to the hours spent in climbing on cliff and slope or to the calm evenings when before sunset the boats left for the night's fishing. The cool row over a calm phosphorescent sea, the long paying out of the line with its huge hooks, the silent pull in the mysterious darkness, the black entrance to a high roofed sea-cave where the night is to be spent, the evening worship mingled with the screams and chattering of the seabirds overhead, and last to be lapped to dreamless sleep by the rippling water. Then in the cold grey light before the faint green flush that precedes the dawn, to recall the hurried meal, the quick pull through the biting air for the hauling of the line, and the struggling of great fish—coalfish, lythe, ling, halibut, skate and that curious half arctic cod, the tush or toish, on which the Finland woman wrote the letter she gave to Gerda.

(At this point a series of lantern slides, illustrating the islands and their natural history, was shown.)

Although I have spoken to-night chiefly of the birds that visit or nest on the group, most of my time on St. Kilda was spent in collecting and making observations on the flora and invertebrata. St. Kilda shelters many rare and interesting species. Amongst the birds and mammals are the wren, the wild sheep and field mouse, the latter attaining a length of nine inches from tip to tip in the largest examples. Many of the insects, too, *e.g.*, *Diamesa tonsa*, Hal., *Leria septentrionalis*, Collin, *Ceratophyllus borealis*, Rothsch., and *C. vagabundus*, Boh., are noteworthy because of our present scanty information as to their distribution. Certain insects are known in Britain, only from the group, others reappear again so far away as Spitzbergen. Our knowledge of geographical distribution, however, even of the Palaearctic fauna, is still too imperfect to enable one to estimate rightly isolated instances of the kind referred to. But it is safe to say that even in terms of local races the really indigenous element in the St. Kilda fauna is exceedingly small. In great degree it is composed of species common in the south of England. Up till now between six and seven hundred organisms have been definitely recorded from St. Kilda, but many groups have been neglected, and vigorous collecting should easily double the present lists. A note on some recent papers is appended. Besides these are numerous scattered records, which I have not thought it necessary to collate, nor have I mentioned a number of purely technical papers dealing with the field mouse.

Beare, T. H. "Notes on Coleoptera from St. Kilda," ("Ann. Scot. Nat. Hist.," pp. 30-33, 1908. Edinburgh, January, 1908.)

Cambridge, Pickard, O. "Spiders of St. Kilda," ("Ann. Scot. Nat. Hist.," pp. 220-223. Edinburgh, October, 1905.)

Clarke, W. E. "On the Mouse of the Outer Hebrides," ("Ann. Scot. Nat. Hist.," pp. 198-199, 1905. Edinburgh, October, 1905.)

Evans, W. "Some Invertebrata, including *Ixodes borealis* from St. Kilda," ("Ann. Scot. Nat. Hist.," pp. 83-88, 1906. Edinburgh, April, 1906.)

Gibson, A. H. "The Phanerogamic Flora of St. Kilda," ("Trans. and Proc. Bot. Soc. Edinburgh," XIX., pp. 155-158. Edinburgh, October, 1891.)

Grimshaw, P. H. "On the Diptera of St. Kilda," ("Ann. Scot. Nat. Hist.," pp. 150-158. Edinburgh, July, 1907.)

Hamilton-Barrett, G. E. H. "On a collection of Mice (*Mus hirtensia* and *M. muralis*) from St. Kilda," ("Ann. Scot. Nat. Hist.," pp. 1-4. Edinburgh, January, 1906.)

Hewitt, C. G. "Some Arthrostraca and other invertebrata from St. Kilda," ("Ann. Scot. Nat. Hist.," pp. 219-221. Edinburgh, October, 1907.)

Hewitt, C. G. "A contribution to a Flora of St. Kilda: being a list of certain Lichens, Mosses, Hepaticae, and freshwater

Algae," ("Ann. Scot. Nat. Hist.," pp. 239-241. Edinburgh, October, 1907.)

Joy, N. H. "Notes on Coleoptera from St. Kilda, mainly collected from bird's nests," ("Ann. Soc. Nat. Hist.," pp. 34-35. Edinburgh, January, 1908.)

Mackenzie, N. "Notes on the Birds of St. Kilda," ("Ann. Scot. Nat. Hist.," pp. 75-80. Edinburgh, April and July, 1905.)

Morton, K. J. "On some Trichoptera collected in St. Kilda by Mr. Waterston," ("Ann. Scot. Nat. Hist.," p. 153. Edinburgh, July, 1906.)

Taylor, J. W., and Waterston, J. "Land and Freshwater Molluscs of St. Kilda," ("Ann. Scot. Nat. Hist.," pp. 21-24. Edinburgh, January, 1906.)

Waterston, J. "On some invertebrates from St. Kilda," "Ann. Scot. Nat. Hist.," pp. 150-153. Edinburgh, July, 1906.)

Waterston, J. "Notes on the Mice and Birds of St. Kilda," ("Ann. Scot. Nat. Hist.," pp. 199-202. Edinburgh, October, 1905.)

Wiglesworth, J. "St. Kilda and its Birds," 8vo. Liverpool, 1903.

(See also Mullens, Kirke, Swann, and Jourdain, "A Geographical Bibliography of British Ornithology," London, 1920, for over 30 additional references to the birds of the islands.)

Notes on some Indian Cuckoos and their habits.

By Colonel R. H. Rattray.—*Read March 22nd*, 1923.

I don't propose to go into the distinguishing characteristics or habits of the Cuckoos. Their general habits are too well known to require going over again, but this I may say that in case of doubt as to whether an egg is of cuculine origin or not, if incubation has advanced, it is easy to tell by the feet if the egg is a cuckoo egg or not. All true cuckoos have the first and fourth toes directed backwards and the second and third forward. India having such a variable climate and terrain it is inevitable that there should be a large number of species of the family. Some few are confined to the plains and low foot hills, while others are in the plains part of the year, migrating to the hills during the breeding season. They are then found at all elevations up to 10,000 feet. There are altogether some 18 species of true cuckoos in the Indian area, but of these I have only personally come across 10. Up to about 20 years ago very little was known for certain about the breeding habits of most species. Mr. A. O. Hume with a few enthusiastic ornithologists endeavoured to work them out with varying success, but it was not till about 1900 Mr. Stuart-Baker, India's foremost ornithologist, asked a few interested men to help him in different parts of the country. Under him Northern India was divided up more or less into areas. With Stuart-Baker in Assam, was Dr. Coltart. Next around Nynee Tal was Mr. S. L. Whymper; at Mussoorie I did a bit, but Mr. B. A. Osmaston of the Forest Department worked there continuously. The next area was round Murree and the surrounding hill stations of Changla and Dunga Galis and Kashmir. In Kashmir Mr. J. Davidson, Indian Civil Service, around Murree, Colonels K. Buchanan, Wilson and myself worked; later when all of us had dropped out owing to retirement, our place was taken by Major F. Magrath. We all worked quite independently of each other and only sent our notes, eggs and observations to Stuart-Baker. In this way we were able to get together a great amount of useful information, with oviduct eggs of many species not up to date settled. All information was published by Stuart-Baker in the Journal of the Bombay Natural History Society. One of the chief difficulties attending the study of any bird or insect in India is the great extent of country; in the plains the few Cuckoos that remain to breed are very scattered, the grass lands they nest in are on the banks of the large rivers, and are of great extent, and in many cases almost impenetrable. In the hills they are found in the large forest tracts, with no clearings or open spaces, at the same time with dense undergrowth. I have often watched a Cuckoo fly down to a spot but have not been able to force my way in. Very few birds except ground builders or those that build low down are victimised. It is therefore almost a matter of luck to find the eggs. I will now take in detail the various Cuckoos.

Cuculus canorus.—The Common Cuckoo. I believe a third name has now been added to this bird and it is considered to be a subspecies of our familiar bird, but I have handled the skins of a good number from the North Western Hills and Kashmir and cannot see much difference. It is a rather lighter coloured brown so I suppose all is correct. The bird is to all intents and purposes our common bird and its call can be heard all day long in our hill stations. The bird breeds through the Himalayas and sub-Himalayas, Assam and Kassia Hills. It has been found in most of the forest lands of Central India and Madras, but is not really common except in the Hill country. My own personal experience of the bird is around Mussoorie, and Murree Hills in Punjab and Kashmir. In all these places it is very common and victimises a large number of different species of small birds, but most of them lay eggs more or less similar to the Cuckoo. I have taken eggs from nests of many ground builders and from nests of Thrushes some 20 feet from the ground, but most of them lay in nests of various Chats. All the eggs I have taken including one oviduct egg, are of a more pinky stone colour than our British birds, with markings of a generally darker shade of same colour and some secondary marking of olive brown. Some eggs are profusely spotted, but the most usual type has few spots; in a few cases there is a ring of spots similar to our Red-backed Shrike. The eggs are as a rule a short blunt oval, very little compressed at the smaller end. The markings are not so dense as in our birds, nor is the ground colour so dull, but of a more pinky tone. Up till quite recent years the question of blue eggs had never been satisfactorily settled. Mr. J. Davidson took a blue egg in Kashmir which he was almost certain was an egg of this Cuckoo, but it was left to Major H. A. F. Magrath to prove it. Maj. Magrath was working the Thandiani Range, about 40 miles from Murree and in the extreme north west corner of our Himalayas, at an elevation of about 10,000 feet. He took a blue egg from the nest of a Dark Grey Bush Chat, which by a process of elimination he was certain must belong to this cuckoo. But he had great hopes of securing an oviduct egg, as the birds were common and calling all over the ridge. This he obtained on June 15th, 1907, thus setting at rest the much vexed question. He wrote to Stuart-Baker, "Luckily I happened to stumble on to a favourite cuckoo feeding ground, in a patch of dock weeds, full of hairy caterpillars. Here on the morning of June 15th last I took my stand with my gun, but without success. However, visiting the place again in the evening I was more successful, and, out of four Cuckoos feeding and flying about, managed to shoot and knock over a female, the skin of which I now send you, and from the oviduct of which I took the fragments of eggshell also sent." There was no doubt about the correctness of identification. The fact of blue *C. canorus* egg is fully established. The eggs are a deep clear blue, nearly as blue as our Hedge Sparrow's eggs.

Cuculus saturatus.—The Himalayan Cuckoo is much like the Common Cuckoo, but is of a general darker tone throughout and an inch or so shorter from bill to tail. The call note is of course very different and is a deep "hoot-hoot-hoot-hoot" repeated four times. Its habits are also very similar, but it is a more forest-loving bird, and, as far as I am aware is a migratory bird and found during the breeding season along the whole length of the Himalayas and the hills on the North West Frontier, through Afghanistan. Its cry can be heard all day long in the forests around all our hill stations. Its parasitic habits are of course the same as all cuckoos. An authentic oviduct egg was first obtained by Mr. Brooks in the Himalayas on June 17th, the year I do not know. It then passed unnoticed till about the year 1900 when I began working the Murree Hills with Maj. Wilson. We found numerous eggs in nests of Warblers in all sorts of positions, but it was not until 1903 I secured oviduct eggs. I had by that time located one of its chief haunts, about a mile out of the town, where its favourite victim, *Acanthopneuste occipitalis*, the Large-crowned Willow Warbler was very common, there were also a large number of small bridges and retaining walls to the ravines affording good nesting sites for the Warblers and a good ground for observation. I set to work and watched all available nesting pairs of the warbler and found most nests. All these nests were built a few inches in the crevices between stones, in the retaining walls or under the bridges. On June 10th, I saw one of these Cuckoos harrying a pair of these warblers, where I knew they had a nest. I shot the bird which proved to be a female with an oviduct egg ready for expulsion. This egg with all my others is in Mr. Stuart-Baker's collection. On 15th and 17th, I shot other birds with oviduct eggs; these were broken but were exactly similar to Brooks' egg and mine of the 10th, and to numerous eggs Maj. Wilson and I had prevously taken and attributed to this Cuckoo. The shells of these eggs are very thin and fragile, of a china white colour, with a few tiny specks and lines of reddish brown scattered over them, in shape a long blunt oval not much compressed at either end. All the eggs I found over a period of four years were found in nests of this Warbler. This later on will prove rather an interesting fact. The eggs must have been placed in the nests by the birds after being laid, as the nest holes were so small, it would have been impossible for any bird larger that the foster parents to have entered the hole. One nest I found in a hole, almost level with the ground, in the stump of a dead tree, contained a Cuckoo's egg. I could not get my hand in but my wife just managed to do so and found the nest was the whole depth of her arm; the Cuckoo must have entered this particular nest and may or may not have laid her egg in the nest. Some years previously Capt. Hutton, a good observer, wrote to Mr. Hume, *vide* Hume's Nests and Eggs of Indian Birds, that he had seen parent Cuckoos feeding the young Cuckoo after it had left the nest; no one else has seen this, nor is it known how many eggs the Cuckoo lays, it would therefore seem impossible for a female Cuckoo to collect or look after more than one young one.

Cuculus poliocephalus.—The Small Cuckoo is a smaller bird than *C. canorus* or *C. saturatus*, averaging 10 inches in length to 13 and 12 respectively, of the others, otherwise there is no great difference. It is a most interesting bird as it has been proved to lay two absolutely different coloured eggs in far separate parts of India and Japan, and to victimise different foster parents in the respective areas. The bird has a very distinctive call note and one that it is impossible to mistake or imitate. An egg attributed to this Cuckoo was taken by Mr. Brooks many years previously and was correctly identified, in view of our subsequent knowledge. Around Murree and the adjacent hills many eggs had been taken by Wilson, Buchanan and myself similar to the egg taken by Brooks, but we had failed to obtain definite proof. However, on June 24th and 26th, I shot females with eggs ready for expulsion, both eggs were broken, but it was easy to see that they were pure white without any trace of markings and were exactly similar to Brooks' and all our eggs. This set the matter entirely at rest for our part of the Himalayas, where the bird victimised Warblers that laid practically white eggs. However, from a letter of Mr. B.B. Osmaston to Stuart-Baker a very different story is told. He and Mr. S. L. Whymper had found in a nest of Warblers, in the hills around Mussoorie and Nynee Tal an undoubted Cuckoo's egg, of a pinky chocolate colour. They were at a loss to what Cuckoo they could attribute this egg. On June 1st, 1903, Mr. Osmaston in the Tons Valley near Mussoorie, shot a female *C. poliocephalus*; the bird in its death struggles, laid a pinky egg exactly like others he had found, thus proving the identity of the unknown eggs. All the eggs taken by Messrs. Whymper and Osmaston were in nests of birds that laid more or less highly coloured eggs, one Warbler in particular, *Horornis pallidus*, The Pale Bush Warbler was most often selected; this bird lays a chocolate egg. In other cases where other birds were selected the Bush Warbler was common all around, It will thus be seen we have oviduct eggs of two such different colours as pink, chocolate and white. I have seen a similar chocolate egg from Assam, which came from the nest of a Warbler nearly allied to the Himalayan bird. Eggs from Japan are apparently invariably laid, in nests of a Warbler, *Cettia cantans*, that lays chocolate eggs and are always chocolate like Osmaston's eggs. We have here the same Cuckoo in North Western Himalayas and Kashmir selecting as foster parents birds laying white or almost white eggs and so have in course of time come to lay white eggs; then in the Himalayas from Mussoorie through Assam to Japan, selecting nests of a totally different species of Warbler with chocolate eggs, their eggs also being of that type. This surely is going a long way in line with Mr. Chance's theory that Cuckoos, whenever they can, select as foster parents the same species that brought them up, and in course of time their eggs assimilate more or less to the colour of the foster's eggs. The two types are similar as to shape and texture, a blunt oval almost the same at both ends, very fragile without gloss.

Cuculus micropterus.—The Indian Cuckoo is about the same size as the Common Cuckoo, average 13 inches long, it is on the whole considerably darker coloured, so much so as to be recognisable almost at a glance. It is found over the whole length of the Himalayas and Assam, more or less rarely in forest lands of Central India. In the Himalayas it is a very common bird and in the breeding season its loud and not unpleasant call, can be heard all day long. The cry is a deep melodious whistle, represented fairly well by the words "Kyphul pukka." It is known to the natives as the kyphul pukka bird. The cry is constantly repeated, as it flies from place to place in thick forest. I regret I absolutely failed to get an oviduct egg, nor up to date has one been obtained. The female is a very shy secretive bird moving noiselessly where trees are thickest. However, I think by a process of elimination, I fairly satisfactorily settled its identity, but still we are not quite satisfied. Mr. Stuart-Baker agrees with me and wrote in the Bombay Natural History Society Journal as follows, "I use the word absolute, for as yet no one has taken an oviduct egg or seen the egg laid; on the other hand, Col. Rattray has, I think, fairly well settled the matter for us and we may take it for granted that his eggs have been properly identified." Again in the same article he writes "Under the circumstances, and by elimination, I think Col. Rattray has proved his case, and I for one, accept these blue eggs as belonging to *micropterus* until better arguments are advanced to show that they are not." I wrote to Stuart-Baker that *C. micropterus* was our most common cuckoo around Murree, and that I took in one year 7 eggs of this bird, all in nests of the Indian Blue Chat, a bird that itself lays blue eggs. I took these eggs at a time when the common Cuckoo had practically finished laying. The eggs of all other Cuckoos of similar size, are very different coloured eggs. *Canorus* had ceased to lay and was known to lay eggs of a very different texture and thickness of shell. I took many similar eggs in 1903. In 1904, I worked around Dunga Gali about 20 miles distant, at a rather greater elevation; here *micropterus* was rare and *canorus* very common. Here I only took one blue egg, but numerous ordinary *canorus* eggs. Stuart-Baker subsequently took *canorus* eggs of usual type where it was the prevailing bird and only found these blue eggs where *canorus* ceased and *micropterus* was frequent. Maj. Wilson and Buchanan both in the same area as myself took similar blue eggs and attributed them to the same bird. The eggs themselves were a very beautiful clear Hedge Sparrow blue, some almost spotless, but the larger number had pale reddish lilac specks all over the eggs. Texture close and fine grain with a good gloss.

Hierococcyx spaveroides.—The Large Hawk Cuckoo. This is a considerably larger bird than any of the others and in flight is very hawk-like, so has a very disturbing influence on small birds. It is not common in any part that I have been in, but is present in most. It is quite common towards Assam. I have seen the bird during the cold season at Dehra Ishmail Khan, one of our frontier posts, otherwise I have only seen it near the hill stations of Mussoorie and Murree. The general coloration is very similar to other cuckoos. Its call is very loud and constantly repeated and is similar to the next cuckoo, it is a high pitched whistle "pee-peeha," but to most people more like "brain-fever." For years I had in my collection a large blue egg, with hard texture and glossy, rough at the small end with minute corrugations, certainly cuculine, that I could not attribute to any bird. I had frequently heard a bird calling in the valley and seen a female sneaking low down in undergrowth in the same ravine. My attention was attracted by this bird to a nest of the Himalayan Whistling Thrush which contained the blue egg referred to. In 1903 near Murree I found a similar egg; incubation was far advanced; I sent this egg with the feet of the embryo to Stuart Baker, who identified it as certainly of cuculine origin. In 1904 near the same place I shot a female with an oviduct egg, it was broken, but in colour and texture was the same as my two unknown eggs. Here was a triumph, I had settled this bird's egg. Stuart Baker and Dr. Coltart later obtained similar eggs in Assam.

Hierococcyx varius.—The Common Hawk Cuckoo is not usually found west of a rough line Delhi-Meerat. My acquaintance with it is not very recent, nor have I any cause to regret the fact. In India we have a great number of birds and insects that cause very great annoyance, but this Cuckoo and its near ally The Koel are an easy first. Their cry is loud, penetrating and agressive to a degree. In common language it is called the Brain Fever bird, from the resemblance of its cry to those words, and its liability to drive one to brain fever. It starts early in the morning and keeps it up all day and on moonlight nights late into the night. The cry itself is very like "brain-fever" repeated incessantly beginning in a low note, gradually rising in the scale till it can go no higher, it then begins all over again. The Koel, the other cuckoo described later, has a somewhat similar sweet cry, it says "who are you, who are you" in the same agressive manner; many are shot in consequence. The habits of this cuckoo are much like all the others. It is not particularly interesting as it victimises the same species of bird, the family of thrush-like birds called Babblers. Its eggs vary in shape from elliptical to almost spherical, with a fine close grain and thick shell. In colour a beautiful blue. The bird is resident over the whole of India proper, but does not ascend the hills to any great elevation. It is only in evidence during the breeding season, so is not often seen though present.

Caccomantis passerinus.—The Indian Plaintive Cuckoo is named from its curious plaintive, querulous cry which sounds like "whe-whew whe-whe-e-ew" repeated several times. It is not to my mind unpleasant, as it is not loud enough to be a nuisance, nor does it in Northern India come near enough to the house to be often heard. It is not common with us and is a forest-loving bird. It lays two or three very different types of eggs in different parts of the country. In Northern India it lays in many small birds' nests, but most commonly in those of a Warbler that builds in the large tufts of Pampas-like grass and low bushes. I have notes of eggs taken around Mussooree and Murree Hills. All the eggs noted from N. India, Assam and Madras are of varying shades of blue with dark brown spots and blotches more or less like the eggs of fosterers. From observation of men in Bombay and the Central Provinces the bird seems to select the nests of the well known Tailor Bird, which seems to be the common Warbler in those parts, in this area its eggs are a pale blue to almost white ground with reddish spots, again similar to the Tailor Bird's eggs. But this is of course a very small difference from our blue eggs, and it is quite possible that out of a long series of eggs, the same variation would be found anywhere. This much has been known for many years, but in 1905, Professor Burnett of Hyderabad, wrote to Stuart-Baker that at Hyderabad Deccan, the Plaintive Cuckoo was very common around that place and that it bred there and laid its eggs in nests of *Prinia socialis*, the Common Wren-Warbler. This bird lays a bright chestnut terra cotta egg in a nest very similar to that of the Tailor Bird. In all these nests he found numerous eggs of a Cuckoo which he eventually traced to this bird; the eggs are of a pink terra-cotta colour. He left some eggs in nests to hatch out, which they did, the young birds being unmistakably *C. passerinus*, our Plaintive Cuckoo, thus identifying the bird absolutely. We have here another cuckoo that lays a totally different type of egg in far separated areas, selecting foster parents of allied, but quite distinct species. It has almost definitely been proved that an individual cuckoo lays a similar type of egg throughout its life, and that the young cuckoos select as far as possible the same species of bird in whose nest they were reared.

A Cuckoo in Madras and Northern India selecting mostly the nest of *Prinia inornata*, the Common Wren-Warbler, its eggs are more or less closely assimilated to the blotched blue eggs of the fosterer. Then in Bombay, the usual nest selected is The Tailor Bird with ground colour pale blue to white, the Cuckoos eggs here are of a paler ground with pale markings ; finally around Hyderabad Deccan nests of *Prinia socialis*, the Ashy Wren-Warbler with chestnut or terra cotta eggs, the Cuckoos eggs are of a pinky terra cotta, lighter than the foster parent's egg, but somewhat similar. In all cases the choice is undoubtedly due to the prevalence in each particular area of the bird selected, and in course of time the cuckoo's egg becomes a colorable likeness of the egg of the foster parent. It is not known how the Cuckoo gets her egg into the nest, but many observers have noticed that the nest, a very small one, is not destroyed or pulled out of shape, the inference is that the eggs are placed in the nest by the Cuckoo after being laid.

Penthoceryx sonnerati.—The Banded Bay Cuckoo is a rare bird in N. India, it hardly came under my notice, but I heard and saw it around Mussoorie. Its cry is a sharp "whi-whip" repeated two or three times, it is far reaching and unmistakable. It keeps to forests and is difficult to see. It has the general appearance of being barred, rufous and dark blackish brown, is a handsome bird, and is about 9½ inches long. I have never seen an egg nor do I know anything about its nesting habits, but an oviduct egg was obtained by Mr. J. A. Kemp in Bombay Presidency, and was in Barnes' collection and has now passed into that of Mr. J. Davidson. I had an egg that may have belonged to this bird, as it had a general likeness to the one in Mr. Davidson's collection, I had heard the bird in the vicinity of the situation of this nest.

Surniculus lugubris.—The Drongo Shrike Cuckoo. Most Cuckoos mimic to a large extent Hawks, but here we have a bird that very closely mimics a totally different kind of bird. We have in India a very familiar bird, called in general by Anglo-Indians, a King Crow. It is a small bird with a long forked tail, black all over, is most pugnacious, and during the nesting season fearlessly attacks and drives off Crows, Hawks and any large birds from the vicinity of their nest. This Cuckoo is a very colourable imitation of the Drongo, it is black with a longish tail, that does not actually fork, but the outer rectrices are turned outwards thus giving it a more or less forked appearance. The Drongos consist of numerous species, and are resident over the whole of India. The cuckoo has always been suspected of victimising them, in fact they have been observed feeding young Cuckoos, but nothing very definite has up to date been settled. The Drongo Cuckoo is a comparatively rare bird, perhaps often overlooked owing to its likeness to the Drongos. Near Murree my attention was attracted to a nest of *Dicrurus longicaudatus*, The Ashy Drongo, around which apparently three Drongos were hovering about. I sent a man up to the nest and on his reporting eggs, I told him to bring them down. I shot one of the parent birds. On examining the eggs I saw one differed considerably in size, appearance and texture, later I found this egg quite fresh whereas the others were slightly incubated. I waited hidden, and saw the Drongo return to the tree accompanied a few trees off by the third, which I stalked and shot. To my surprise I saw it was a female Cuckoo. I attribute this egg, which is certainly cuculine, and is not the egg of any other cuckoo breeding in the locality, to this bird. It agrees with other eggs supposed to belong to this Cuckoo, fairly well in size and colour, so though not actually proven may fairly be attributed to this bird.

Coccystes jacobinus.—The Pied Crested Cuckoo as its name implies is a pied black and white bird, black above and white below is a fairly good description, it has a largish erectile crest on its head. It is rare in the Punjab, west of Delhi. I shot a bird near Benares in Bengal with an oviduct egg and took another from a nest of the Jungle Babbler; this is all I know about it, but numerous oviduct eggs have been taken by others. The eggs vary from elliptical, blunt at both ends to almost spherical, and of a clear deep blue unspotted. It is an uninteresting bird, but where it occurs it is familiar, coming quite close to houses. Its call is a harsh disagreeable whistle.

Eudynamis honorata.—The Indian Koel is a well known and much-hated bird on account of its cry, but it is a very interesting one, it is the only one of its genus that is given to parasitic habits. All its nearest relations are repectable nest-building birds. It has a harsh penetrating cry of "who are you, who are you," which it starts in a low key, repeating it each time higher and higher till its voice cracks, it then starts all over again. It begins in early morning and on moonlight nights keeps it up all the time. It is most energetic and persevering from about 1 p.m. till 4 p.m. just when most people are trying to get a short hour of restless sleep. It has another cry which is I believe common to both male and female, of an oft repeated "koel, koel," but this is not so agressive. The male bird is a deep blue black all over and most conspicuous, the female is brown above, head and neck spotted white, back with larger white spots, underside the spots pass into white bars, and in the shade of trees is most inconspicuous. This is of the greatest consequence to the bird when it comes to depositing eggs. The bird generally victimised is the common Indian Crow. In Calcutta where, in the Fort, both Crows and the Koel are in hundreds, I have often watched with interest these birds. The Koels go about in pairs, on approaching a Crow's nest, the male, in a most agressive manner, flies ahead to the tree and starts calling "who are you, who are you," the pair of crows at once give chase, the Koel flying off still calling, the chase is kept going by all the Crows near, in the meanwhile the female slips on to the nest and lays her egg. The time occupied is very short, about a minute. A very good observer, Mr. D. Dewar, Indian Civil Service, has also noted this in a most interesting article on the Koel in the Journal of the Bombay Natural History Society; he states that he is certain the Koel laid in the nest as the bird was in full view, and he could see the bird's beak was open, whereas when she left the nest she took a crow's egg away with her and broke it. The Koel's egg is a small edition of a Crow's egg, but much rounder in shape. As many as three Koel's eggs have been found in one crow's nest. The Koel is resident and widely distributed in India.

To sum up shortly what is now known definitely about the various cuckoos, their habits and eggs.

Cuculus canorus.—The Common Cuckoo. Ordinary forms well known, rather different from our bird. Blue oviduct egg has now been taken.

C. saturatus.—The Himalayan Cuckoo. Oviduct eggs taken by Brooks and myself. The eggs white with minute specks of black or dark brown.

C. poliocephalus.—The Small Cuckoo. Oviduct eggs by Osmaston, a uniform pink chocolate, laid in nests of birds that lay somewhat similar coloured eggs. These were taken in Himalayas, east of Mussoorie, and on through Assam.

Oviduct eggs by myself, but pure white and laid in nests of birds that lay white or almost white eggs. West of Mussoorie.

C. micropterus.—The Indian Cuckoo. Oviduct egg not up to date obtained, but by elimination most probably blue with more or less pale lilac specks. All mine were laid in nests with blue eggs.

Hierococcyx spaveroides.—The Large Hawk Cuckoo. Oviduct egg by myself, blue without spots. Hard texture and satiny to touch. Mr. Stuart-Baker thinks it also lays chocolate brown eggs, but we have no proof.

Hierococcyx varius.—The Common Hawk Cuckoo. Numerous oviduct eggs, all blue unspotted. Lays in nests of birds that lay blue eggs.

Caccomantis passerinus.—The Plaintive Cuckoo. Oviduct eggs by Miss Cockburn in Madras. Eggs blue with brown black blotches, also pale blue to white eggs with pale reddish specks. Laid in nests either purse-like or in the well known Tailor Birds nests that lay similar eggs.

Professor Burnett, oviduct eggs around Hyderabad, Deccan, pink chocolate eggs laid in nest of bird that lays bright chestnut to terra cotta coloured eggs.

Penthoceryx sonnerati.—Banded Bay Cuckoo. Oviduct egg Kemp. Eggs a brownish pink.

Surniculus lugubris.—The Drongo Cuckoo. Oviduct eggs not yet obtained, but eggs probably white to pale pink ground, blotched and spotted with two shades of brownish red.

Coccystes jacobinus.—The Pied Crested Cuckoo. Numerous oviduct eggs taken. Dark blue, unspotted, curiously spherical in shape. Laid in nests of birds with blue eggs.

Eudynamis honorata.—The Indian Koel. Oviduct eggs and habits well known, victimises Crows. Eggs greenish with blotches reddish very like small crow's eggs.

From my eggs and those of numerous other observers, it will be noted that many of our Cuckoos lay in far removed parts of India, eggs of a totally different type. That where the eggs are differently coloured, the birds victimised are different species of Warbler, that are most common in each area and whose eggs nearly approach the Cuckoo's in colour. It therefore seems reasonable to presume, that this has come about in course of time, through the egg of a particular type having the greatest chance of being received by the bird victimised, and so becoming the type prevailing in that district. Mr. Stuart-Baker made these remarks in an article on Cuckoos and their habits as long ago as 1898, in the "Journal of the Bombay Natural History Society." Most observers in this country claim rightly that in any restricted area they can separate the eggs of a particular Cuckoo, and that the type of egg laid in the nest of any one species of foster parent, has a more or less remarkable likeness to the foster parent's egg, the Hedge Sparrow alone excepted. But we in India with a far greater area and a greater number of species for the Cuckoos to select from, find a difference so wide in colour of eggs from the different areas, that it is hard to believe without absolute proof, they are the eggs of the same species of bird. Fortunately we have this absolute proof. Of the remaining species of Cuckoos, I am unable to speak from personal observation, they are as interesting, but of many we know nothing of real fact. Some are suspected of laying variously coloured eggs, but it has not up to date been possible to obtain oviduct eggs. It is therefore best to leave them alone and not enter into pure guess work.

Mosses,

By E. H. Ellis.—*Read April 12th,* 1923.

Mosses are part of a group (*Bryophyta*) of cryptogamic plants classified between the Thallophyta and the Vascular Cryptogams, showing a regular Alternation of Generations. The leafy moss-plant is the gametophyte with the haploid number of chromosomes, and the fruit is the sporophyte with the diploid number. It has been suggested that an alternation of generations is a modification to climate, to enable the plant to endure the inclement period of the year in a resting condition.

The spores of mosses are unicellular bodies, usually spherical in shape with a smooth or bristly outer wall. Their protoplasmic contents may either fill the cell, or contain vacuoles and oil drops. Under favourable conditions a spore will germinate. Two types of germination can be distinguished amongst mosses, according as to whether the spore germinates immediately, or in from two to six months. The first type includes those species whose spores ripen in the spring, so that maximum growth may be attained before the summer (*Funaria hygrometrica* has germinated in four days.) The second type includes species whose spores ripen in autumn or winter. Their long resting period enables them to await favourable conditions for germination in the spring (*Polytrichum juniperinum* took three and a half months to germinate). A moss spore has a cutinized exospore and a more or less plastic endospore. On germination the exospore bursts and a green filamentous protonema appears. Sometimes (notably in *Tetraphis pellucida*) a flat chlorophyllose thallus is formed, giving the young plant a start in life. Growth is continued indefinitely by continued division of the terminal cell, the transverse cell-walls being formed at right angles to the axis of the filament. Eventually, two kinds of growth, the erect and the creeping protonema, can be distinguished. The filaments on the surface form the erect protonema, while the remainder grow downwards and become the rhizoids. The rhizoidal walls give a cellulose reaction, but become cutinized with age, and contain tannin which hardens them against attack by soil fungi and bacteria. The protoplasm in the older filaments is very dense and vacuolate, and plasmolyses readily, remaining viable for long periods in this condition. The transverse cell-walls of the rhizoids become oblique, instead of being at right angles to the axis of the filament. There is no specialized conducting tissue in the rhizoids, the food stream depending for upward conveyance upon osmotic pressure and the fact that the cytoplasm is a semi-permeable membrane; consequently, the oblique septa assist in conduction of food from cell to cell on the principle of maximum exposure of surface to attain maximum passage. The rhizoids of *Schistostega osmundacea* have been reported to be luminous. This is not strictly true, as the luminous effect depends entirely upon the optical properties of the cells. Light entering the cell is concentrated upon the compacted chloroplasts from which it is reflected, and leaves the cell in a similar direction to that in which it entered.

At intervals on the erect protonema, concrescent buds form, giving rise to the leafy moss plant. The first few leaves have usually no midrib and fold closely over the growing bud, but are separated later by the rapidly elongating stem. The stems of mosses consist usually of only a thickened epidermis, a loose parenchymatous cortex and a central water-conducting cylinder, except in the case of *Polytrichum*, where there are definite areas "hydrom" and "leptom," analogous respectively to the "xylem" and "phloem" of the flowering plant stem. The epidermis often bears a number of rhizoids which function as a jacket for the capillary conduction and retention of water. The leaf-traces have no connection, except physiologically, with the water-conducting area, and in some cases (*Mnium*) are prolonged into the stem and extend vertically, parallel with the long axis. The stems are well constructed mechanically and show both a compound girder structure and structure on the principles of the ferro-concrete building system, giving maximum strength with minimum expenditure of material. Tensile strengths have been determined in some cases, and in *Polytrichum*, the fruit stalk has a breaking strain of 11·5 kgs. per sq. mm.

At the apices of the stems of hermaphrodite species at certain times of the year, rosettes of leaves containing the sexual organs may be found. The antheridia (♂) are spindle-shaped bodies containing the spermatozoids. The archegonia (♀) are flask-shaped bodies with a long neck, containing the egg. Both antheridia and archegonia are mingled with modified hairs (paraphyses), which act as spacing agents and keep the sexual organs supplied with water. Normally, mosses require water to enable fertilization to take place. After a fall of rain, a plant will be covered with a thin film of water sufficient for the purpose. The peripheral and especially the terminal cells of an antheridium become greatly distended, the terminal cells become colourless and are pushed apart; the mass of spermatozoids is ejected and the opening closes. The mucilaginous wall gradually dissolves and the spermatozoids are set free: each spermatozoid being a short thick rod with two long cilia. Before an archegonium becomes ripe, the central layer of cells of the neck disintegrates acropetally, the pressure of the mucilage thus formed forcing off the terminal cells, transforming the neck into a hollow tube. A spermatozoid swims near, is further attracted by cane sugar from the archegonium, travels down the neck, and fuses with the egg-cell to form the embryo. The archegonium now becomes cutinized, forcing the foot of the rapidly-growing embryo down into the parent tissue, thus ensuring a supply of food material. At length the walls are ruptured, and the old archegonium is carried up on the elongating fruit stalk, becoming the calyptra which protects the young fruit. Apart from the fruit stalk, the embryo forms two parts: the amphithecium and the endothecium. The amphithecium gives rise to the capsule wall, the lid and the peristome; the endothecium to a central sterile part, the columella, around which is the archesporium from which the spores are formed. It is during the last reduction division of the archesporial cells, restoring the chromosomes to the haploid number, that the sex segregations occur in dioecious plants.

The structure of the mature spore capsule is modified for the most effective formation and distribution of the spores. In some cleistocarpous plants no mechanism for spore dispersal exists. The fruits are hidden amongst the leaves, and the capsule is said to rot, or (being easily detached) to be carried away as a whole by rain. Other plants have a peristome, a hygroscopic mechanism of hairs, bordering the capsule mouth. The peristome may serve merely as a lid to the capsule, the teeth bending over the capsule mouth in wet weather and backwards in dry weather (*Weisia*); or it may twist round into a brush (*Tortula*), and so in addition brush the spores out. In *Andreaea* the capsule wall splits into four valves, and the spores are shaken or blown out. Finally, in the case of *Splachnum*, which grows upon dung, it has been demonstrated that the dung-flies *Scatophaga* and *Calliphora* are responsible for spore-dispersal.

Mosses apparently did not receive much attention in early times. No mention is made of them by Theophrastus in his work on plants. References are often made to a "Polytrichon of Pliny," in early works, but a figure of this in the Herbarium of Apuleius Barbarus (1480) shows it to have been Maiden-hair Fern. Hieronymus Tragus (1552) figured and described two species of mosses, *Polytrichon majus* and *Polytrichon minus*, one figure of which is an excellent drawing of Sundew. The development of the subject was largely involved in the development of the microscope. Hooke, in his "Micrographia" (1665) gave a description of a moss, as seen under his compound microscope. Linnaeus mistook the spores for the spermatozoids, and the large rosettes of *Polytrichum* for the female flowers. In 1741, the study had so far progressed for a large systematic work like Dillenius's "Historia Muscorum" to appear; and in 1787, Hedwig described and figured the sexual organs. The "moss upon the skull of a man" referred to by Gerard and other authors is a lichen (*Parmelia saxatilis*); similarly Iceland Moss is a lichen (*Cetraria islandica*), and Irish Moss is a seaweed (*Chondrus crispus*).

The forms of many mosses can be related to their ecology. The word "moss" itself has an ecological derivation, meaning a "bog," obviously relative to the common habitat of many species. Both chemical and physical factors influence the distribution of many of the higher plants and there is doubt as to their relative importance. As concerns mosses, the chemical factors have been thought to be more important, although such a factor as light-intensity must be considered. Definite associations of mosses have been recognised similar to those of the higher plants; calcicole and calcifuge species have been distinguished. Aberrant occurrences are sometimes more apparent than real. For example, calcicole plants occurring on sand dunes or on siliceous grassland may be due respectively to comminuted shells providing sufficient lime, and to frequent liming of the land. Many mosses show adaptions to xerophytic life, *i.e.*, they show modifications for conservation of water. Mosses easily adapt themselves to differing conditions of habitat, often causing a totally different appearance of the same plant. Cases have been recorded in which mosses discoloured by urine have been given varietal names. Apart from the formation of close tufts, from which water can only evaporate slowly, owing to only the leaf-apices being exposed, there are structural variations such as investments of dead or colourless cells, which protect the active chlorophyllose cells from drying winds and too powerful sunlight. Examples are *Bryum argenteum*, which owes its specific name to the characteristic silvery shine caused by the hyaline cells of the upper part of the leaf; *Tortula muralis*, where the nerve protrudes beyond the blade of the leaf—the leaves are closely twisted and packed together and only the hair-like excurrent nerves are exposed; and the genus *Leucobryum* in which many species have a layer of chlorophyllose cells covered, except at the margin, by layers of colourless cells, whose internal walls being perforated by large pores, act as a sponge. In *Sphagnum*, a large group of mosses inhabiting bogs and involved in the formation of peat, a similar structure is found. Some of the leaf-cells are colourless, supported by spiral thickening and have pores, and, consequently, are capable of holding a large amount of moisture. It was this, combined with its antiseptic properties (owing largely to dissolved gallic acid) that enabled *Sphagnum* to be used during the war as a basis of surgical dressings. The moss was collected and the water squeezed out of it, all odd pieces of stick and leaves were then picked out, and the moss was dried. When dry, the moss was filled into flat bags of "long cloth" about 4″ long and 2″ wide. The idea is not new, as *Sphagnum* was similarly used during previous wars; but it was not used in any quantity until 1914, and in 1918, Scotland was supplying about 400,000, and Canada about 2,000,000 pads per month.

Other cases showing arrangements for water conservation are the lamellae on the leaves of *Polytrichum*, the doubled leaf-blade of *Fissidens*, which forms a water-sac, and thickening of the leaves as in *Barbula unguiculata*, which when growing on dry walls has succulent leaves. External biologic factors also assist in conservation of the water-supply, such as associated gelatinous algae (*Nostoc*).

Some Ancient Naturalists and their Work.

By Robert Adkin, F.E.S.—*Read May 24th*, 1923.

We, who live in this twentieth century, with its easy means of intercommunication, with our apparatus of precision enabling us to carry out our most intricate experiments with comparative ease, and our microscopes now brought to such a state of perfection that we can by this aid examine exceedingly minute organisms, can hardly realise the difficulties under which the ancient naturalists carried on their work. For, be it remembered, their opportunities for intercourse must have been few and far between, and such apparatus as they had for assisting them in their work was of a primitive character. They undoubtedly had some knowledge of the microscope in its simplest form in very early times, but the compound instrument was not invented until quite the end of the sixteenth century, and even then was of the crudest kind; and although it was somewhat improved a century later, it was not until well into the nineteenth century that it was brought to anything approaching its present standard.

One often wonders, too, when man did first begin to study Natural History. The subject is so inextricably mixed up with our everyday life that we must be inclined to think that from the earliest times, the time when man first became capable of reasoning, he must, in his primitive way, have studied the creatures and other natural objects by which he was surrounded; for on his knowledge of them and their relationships to himself, his daily life depended. Yet it is not until the time of the highest Greek culture that we get any coherent writings bearing on the subject.

In or about the year 484 B.C., Herodotus was born; and during his early manhood he travelled the greater part of the then known world. He wrote a great work, ostensibly on the Greek wars, but in it he describes the rivers, climates, peoples, and remarkable animals of the countries that he had visited. He was called "The Father of History," and it may well be that it was his writings that inspired the spirit for the study of Natural History manifested by his contemporary and subsequent writers.

Xenophon, too, was not only a historian but an inquisitive naturalist. Theophrastus, also a naturalist and philosopher, is credited with being the author of 227 works, of which his "History of Plants" and "Causes of Plants," with some other treatises are still known, but his valuable zoological series, in which he dealt with the instincts and habits of animals, were unfortunately lost.

But the greatest philosopher and naturalist of that period undoubtedly was Aristotle. He was a deep thinker and an able writer; he knew something of the migration of birds and fish ; he detected the sound-producing mechanism in the grasshopper ; he had knowledge of the early stages of the developing chick in the egg, and many other of the secrets of Nature. His books, of which many are still extant, are regarded as classics, among them, to mention only three, the "Historia Animalium," "De Partibus Animalium," and "De Generatione Animalium," are of special interest even to the present-day naturalist. By the generosity of the late Dr. Benjamin Jowett they have been translated into English and are thus available to us all.

During the Roman Period which followed, the greatest naturalist was Pliny, whose "Natural History" has been handed down to us and is still current literature. He discoursed upon a vast variety of subjects, and although there was little that was new in his writings, he has left us quite a readable book and one that we may peruse with interest to-day.

After Pliny, the decline of European science and literature was rapid ; and Oppian, who is said to have died somewhere about 200 A.D., appears to have been the last of these ancient naturalists.

For upwards of a thousand years natural science languished. In its place, men who ought to have known better, wrote of dragons, griffins and such mythical creatures, creating an era of superstition and bigotry.

Early in the sixteenth century a revival began to be apparent, starting in Germany and spreading thence over Europe. The botanists were the first to move : the physicians were beginning to understand the medicinal uses of herbs, and men were writing treatises on plants, most of such authors having qualified as physicians. From these beginnings the "Herbals" were evolved, and the advent of the art of printing enabled copies to be multiplied. Among these authors the names of Brunfels, Bock, Fuchs, and Gesner may be mentioned, the last-named having also written a History of Animals. In our country William Turner and John Gerard both published Herbals. That of the latter, which is perhaps the best known, was published in 1597, and in it some attempt at classification is made, each plant is illustrated by a crude woodcut, and is fully described; we are told the situations in which it grows, the time of year when it may be found, and its medicinal uses. The book is interesting in its way, but there is little original work in it, it being founded largely on the work of earlier authors.

But during this period the animal, as distinct from the botanical side of Natural History, made little progress. Gesner, whom we have already mentioned, was engaged upon the task of a complete history of animals and plants, but was overpowered by the vastness of the task. He seems to have had a sketch of a History of Insects made by one Wotton. To complete this he obtained the assistance of one Penny, but Penny died, and the manuscript was passed on to Thomas Moufet, who also died. It came ultimately into the hands of Sir Theodore Mayerne who, in 1634, published it under the name of "Insectorum sive Minimorum Animalium Theatrum,"* and it is commonly known as Moufet's work. It was printed in Latin and embellished with a large number of woodcuts in the text and a few full page plates in black and white. Although many of the figures are good representations of the species for which they are intended, the book is of no great scientific value.

It was at about this period that Redi came on the scene, with his experimental work that was destined to cause a great advance in the beliefs of naturalists, who up to this time had clung to the doctrine of abiogenesis, or spontaneous generation. Aristotle had taught, and indeed had laid it down as an observed fact, that some animals spring from putrid matter, that decaying flesh breeds worms, and so forth; and this appears to have been the generally accepted theory up to the middle of the seventeenth century.

Francesco Redi was born at Arezzo, in Tuscany, in 1626. He took his Doctor's degree at the University of Pisa, and subsequently became court physician to Ferdinand II., by whom he was much beloved. He was also head of the Medicean laboratory. In 1668 he published the book "Experienze Intorno alla Generazione degl' Insetti," in which he gives the details of his experiments on the generation of insects in considerable detail. In his opening remarks he recites the various theories on the subject that had been put forward by his predecessors, and mentions that "that great philosopher of our time, the immortal William Harvey, held that all living things are born from seed, as from an egg, be it the seed of animals of the same species or elsewhere derived." William Harvey was a physician of London, who died in 1657, when Redi would be just over thirty years of age. It may well be assumed that it was largely the theories that he had advanced that gave Redi the incentive to carry out his experiments, with a view to proving whether Harvey's theories or those of the older naturalists were the correct ones. Be that as it may, Redi set to work; he placed dead snakes, pieces of veal, horseflesh, birds and fish in open boxes, and within a few days found all of them swarming with maggots, from which he reared numbers of flies of various species. This, of course, proved nothing; but on repeating the experiment and keeping a closer watch he detected some unhatched eggs on some of the meat. He tells us that having considered these things he "began to believe that all

* Miall, "The Early Naturalists," page 85.

worms found in meat were derived directly from the droppings of flies, and not from the putrifaction of the meat." He then put a dead snake, some fish, some eels and some veal into four large wide-mouthed flasks, and well closed and sealed them, and in four others put similar things, but left them open. In a few days all the things in the open flasks were swarming with maggots, but the meats in the closed vessels were not maggotty; neither did they become so, although he kept them until they were thoroughly putrified. He tells us that not satisfied with this he repeated his experiments again and again, but always with a like result, thus definitely exploding the theory of abiogenesis.*

Malpighi, an Italian (1628-94), was a skilled microscopist. Perhaps his most notable discovery was the circulation of the blood, which he first saw, coursing through a network of small tubes on the surface of the lung and of the distended urinary bladder of a living frog. The difficulties of microscopic work in his day may be well judged by the fact that it took him four years after this discovery to reach a clear understanding of the corpuscles in the blood. He also made several other important discoveries in regard to the structure of the secreting glands, the vesicular structure of the human lung, and so forth. He published several treatises, he also sent an account of some of his work to the Royal Society of London, by whom it was published under the title of the "Works of Malpighi"; but much of his manuscript was destroyed by a fire that occurred at his house, and destroyed all his books, furniture, and pictures.

In 1667 Christopher Merrett published his "Pinax Rerum Naturalium Britannicarum," an unpretentious little book of some 220 pages. It is little more than a list of names of plants, mammals, birds, insects, etc., but is noteworthy as being an attempt, even if not a very successful one, at a system.

Jacob Petiver, a druggist of London, published several works between 1695 and 1711. He seems to have been an all-round naturalist and collector of curiosities. His "Gazophylacii Naturae et Artis," commenced in 1702, is little more than a collection of, as a rule well executed, plates, depicting anything from a wooden chair presented by the "New East India Company" to the President of the Royal Society, to the smallest insect. Mammals, birds, reptiles, fish, and insects, are all figured in great variety, and he tells us whence he obtained them. The only value of the work is as a record of species, often the first in this country.

In the mean time Jan Jacoby Swammerdam had been doing much

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* Aristotle also had taught that eels lay no eggs and were possibly generated from earthworms, but Redi satisfied himself that eels visited the sea for the purpose of spawning, and that the resulting elvers ultimately ascended the rivers.

better work. Born in Amsterdam, the son of an apothecary, he early in life took up the study of Natural History and became a skilled anatomist. He devoted a large part of his attention to the structure of animate nature. He worked on the structure of the spinal cord in man, discovered the valves of the lymphatic vessels, demonstrated that in the full-fed caterpillar the wings, legs, and proboscis of the butterfly were contained, and unravelled many other of Nature's secrets. Of the works that he published perhaps the best known are the "Historia Insectorum Generalis," which first saw the light in 1669, and was several times reprinted, and the posthumously published "Biblia Naturae" (1737). Much of Swammerdam's work is wonderfully exact, and would rank well with the best work done in modern times. There can be no doubt that his work gave a powerful impulse to the comparative study of animal structures.

As Herodotus was called the father of history, so may we claim John Ray as the father of Natural History in Britain. Ray was born in the little village of Black Notley, in Essex, in 1627, the son of a blacksmith, and was educated at Braintree Grammar School until he was eighteen, when he went to the University of Cambridge. He must have been a man of more than average ability, for by the time he was thirty-five he was not only learned in the ancient literatures, and competent in divinity, but known to some few as a naturalist of great promise. While at College, Ray became very intimate with another promising naturalist, Francis Willughby, and there is no doubt that much mutual encouragement ensued. It was their ambition to publish complete histories of birds, fishes, insects, and plants. Willughby died at the early age of thirty-seven, leaving more or less complete manuscript of the two first named; but how much of it was his work and how much Ray's it is impossible to say. Ray managed to revise and complete them both, and was scrupulous to publish them as Willughby's work. The "Catalogus Plantarum Angliae" was published in 1670, but although Ray lived to the good old age of seventy-six he did not see his history of insects in print. It was, however, published in 1710, by, I believe, Dr. Derham, with an appendix by Martin Lister. Ray's "Historia Insectorum," the name under which it was published, is undoubtedly a thoughtful work; but it is somewhat difficult to follow on account of the almost complete absence of names to the species described. There is little that was new as to classification; it is, however, a work of some importance, to which reference is made, even in these days.

It is not, however, only by his published works that we shall remember Ray. He was a man of deep thought, had travelled much, and was a pleasant correspondent. Nothing is so helpful to the student as a sympathetic interest in his work, and this is just what Ray seems, by reason of these attainments, to have been able to give his fellow students, and in this way sown the seeds of a taste for the study of Natural History that was to blossom forth long after his own time.

A paragraph in Ray's little book, "The Wisdom of God manifested in the Works of the Creation" (which is really the substance of some addresses delivered by him in the "Chapel of Trinity College, Cambridge"), has always struck me forcibly as showing the sort of man he was, and I am constrained to quote it here. He says: "Let it not suffice us to be book-learned, to read what others have written, and to take upon trust more falsehood than truth; but let us ourselves examine things as we have opportunity, and converse with Nature as well as books. Let us endeavour to promote and increase this knowledge, and make new discoveries, not so much distrusting our own parts, or despairing of our own abilities, as to think that our industry can add nothing to the inventions of our ancestors or correct any of their mistakes. Let us not think that the bounds of science are fixed like *Hercules* his pillars, and inscribed with a *Ne plus ultra*. Let us not think we have done when we have learnt what they have delivered to us. The treasures of Nature are inexhaustible. Here is employment for the vastest parts, the most indefatigable industries, the fairest opportunities, the most prolix and undisturbed vacancies. Much might be done would we but endeavour, and nothing is insuperable to pains and patience. I know that a new study at first, seems very vast, intricate, and difficult; but after a little resolution and progress, after a man becomes a little acquainted, as I may so say, with it, his understanding is wonderfully cleared up and enlarged, the difficulties vanish, and the things grow easier and familiar."

Antony van Leeuwenhoek, born at Delft, in 1632, was not, like most of the great men of his period, connected with any of the universities, and may be regarded rather as what we should now call a skilful amateur naturalist and microscopist. Nevertheless, he did much useful, if often somewhat superficial, work. Among his more important researches may be mentioned that he advanced Malpighi's observations on the circulation of the blood; he discovered that Aphids are viviparous and produce many generations without the intervention of the male; and worked out the life-history of the flea. His "Arcana Naturae" appeared in 1695; and much of his more important work is published in the Philosophical Transactions of the Royal Society.

René de Réaumur, another distinguished naturalist, was born in 1683, at La Rochelle, in France, and had the advantage over many of his predecessors in that he was possessed of ample means to enable him to follow out his researches. His great work, "Mémoires pour servir à l'histoire des Insectes," in six thick quarto volumes, was published in Paris in 1734-42. His "Insectes" embraced a much larger field than we are accustomed to include in that class, in fact anything outside mammals, birds and fishes came within his view as insects. He was a fascinating writer, but his pleasant style was never allowed to detract from the accurate recording of his observations. He delighted in rearing caterpillars through to the perfect insect, thus gaining much useful information. Like Swammerdam, he was a skilled anatomist, able not only to check the work of his predecessors, but also to elucidate many new facts. He proved that the queen bee is the only functional female in a hive; that some of the lower orders of creatures multiply by budding; and confirmed Leeuwenhoek's discovery that Aphids are viviparous and produce several generations without being fertilised. He ascertained that the shell of the hen's egg is porous, and demonstrated that eggs might be kept in fresh condition for considerable periods by the shell being varnished, so as to exclude the air. He also carried out ingenious experiments on the digestion of birds. For nearly fifty years he was one of the most useful and active members of the Academy of Sciences. There is no doubt Réaumur gave a great impetus to the scientific study of Nature in France, as Ray had done in Britain; but his work, in common with that of his predecessors, is rendered less easy to follow than it otherwise might have been, by reason of the absence of a generally accepted system of classification and the lack of widely known names to the species dealt with; but this difficulty was soon to be overcome.

Carl von Linné, better known to us as Linnaeus, was born in the little village of Rashult, in Southern Sweden, in 1707, his father being the minister of the parish of Stenbrohult.

"The parsonage of Stenbrohult had a good garden, and the pastor, who was something of a naturalist, taught his son botany, besides the ordinary learning of the grammar school. Linnaeus' teachers, whether at home or at the gymnasium, thought him a dunce. There was talk even of binding him to a shoemaker; but a doctor, who happened to be consulted, pointed out that the boy's enthusiasm for natural history was a promising sign, and advised that he should be brought up to medicine."*

At the age of twenty he entered the University of Lund, but meeting with nothing but disappointments there he, after a year, migrated to Upsala, the chief Swedish university. After many troublous years he achieved his ambition by obtaining the chair of botany.

Linnaeus had in the meantime travelled much. He explored a large part of Lapland, the journey occupying some five months, during which he covered nearly four thousand miles and met with many hardships; but he considered himself well repaid by the many curious sights that he witnessed. It is said that he discovered a hundred hitherto undescribed plants during his journey. He also

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* Miall, "The Early Naturalists," p. 311.

made explorations in the Swedish province of Dalecarlia, in the Baltic Islands of Oland and Gothland, and in Scania. He spent some three years in Holland, and visited England and France. Even after he had himself finally settled down in his university, he was wont to send out his most competent pupils to investigate the natural history of distant lands, and thus gathered vast stores of fresh information. The difficulties and severity of these expeditions will be the better understood when it is remembered that nearly one-third of the men who undertook them died abroad in their youth.

Linnaeus was a prolific writer, but of all his publications the best known to present-day naturalists is his "Systema Naturae," the first edition of which, a modest volume of fourteen folio pages, was published in 1735, when he was only twenty-eight years of age.

As from time to time fresh information came to hand from the various expeditions that had been sent out, and from other sources, new editions were published, the tenth; which is regarded by present-day naturalists as the starting point in their nomenclature, appearing in 1758 and 9; and the twelfth, a book in three volumes, and containing some 2,600 octavo pages, in 1766-8. This appears to have been the last real edition published by Linnaeus, although there were many reprints.

The "Systema Naturae" is in effect a systematic and descriptive catalogue of animate nature. Every known animal and plant is assigned to its class, order, genus, and species. It was not the first attempt that had been made at a system of classification, but all former attempts had proved ambiguous and unsatisfactory. Linnaeus, however, seems to have possessed that knowledge of the relationships of one creature to another, and that power of terse description, that was to enable him to evolve a system that was to bring order out of chaos and lay the foundations of systematic natural history.

Linnaeus, as I have already mentioned, had, in the course of his early travels, visited England. His reception at the hands of the then leading British naturalists was, we are told, none too cordial, but fortunately the seed then sown was destined to grow and ultimately to flourish. On the death of Linnaeus his books, manuscripts, and collections passed to his son, and on his death were offered for sale. Fortunately for us, Sir J. E. Smith purchased a large part of them and brought it to this country. He founded the Linnean Society of London, into whose keeping they ultimately came. The value of these collections to the present-day systematist cannot be over estimated. Containing, as they do, the very specimens to which Linnaeus gave his names, any knotty points are easily cleared up by reference to them, and doubts easily converted into certainties. The Linnean Society, as you all know, is in reality the leading Natural History Society of the Empire. We have our Botanical Society, our Entomological Society, our Zoological Society, and so forth, all dealing each with its own special branch of Natural History, but the Linnean embraces the whole field.

Buffon, or to give him his full title, Georges Louis Leclerc, Comte de Buffon, was born at Montbard, in Burgundy, in the same year as Linnaeus. He studied law and mathematics, and became a member of the Académie des Sciences. A Jardin du Roi for the study of medicinal plants had been established in 1626, but it had achieved no great fame up to the time when Buffon was made intendant of it in 1739—a post which also gave him command of the Royal Museums and the collections of living animals and plants. He at once set to work to enlarge them and bring them up to date. What the King could not pay for Buffon did; and there is no doubt that he brought them to a much greater state of perfection and usefulness than they had ever enjoyed before. His connection with the garden and his tours through France, Italy, and England, brought him into contact with many of the leading naturalists of the day, and no doubt inspired in him a taste for natural history.

His father was a rich man, and on the death of his mother, when he was twenty-five years of age, he came into the fortune. He was also an ambitious man, and conceived the idea (possibly instigated by the publication of Linnaeus' "Systema"), of writing a complete Natural History. As he progressed he found the task, as others had found before him, more than one man could ever hope to accomplish, and sought the assistance of others in carrying out his enterprise. In the end the great work "Histoire Naturelle" was produced in fifteen volumes, the first appearing in 1749 and the last in 1767. Buffon's "Natural History" was received with acclamation, and translated into most of the languages of Europe, but it was not a scientific work, it was not in the same plane with the works of Linnaeus, Ray, Swammerdam, and many others. Its notoriety was short lived, and in the present day it has fallen almost completely into disuse.

Another well known naturalist of this period was Gilbert White. White was born in the pretty little Hampshire village of Selborne, in 1720. His father, John White, was a barrister, his grandfather, from whom he took his Christian name, was for many years vicar of Selborne, and it was he who built the house, known as the "Wakes," where Gilbert, the naturalist, was destined to spend a large portion of his life. What first induced White to interest himself in natural history subjects does not appear to be known. He is said to have been a small man of very gentle manner, and not of particularly robust health. It may be that it was simply his natural surroundings that appealed to him, and that he thus became interested. At any rate, we do know that, again and again, when preferment was offered to him that would have necessitated his removal from his native village, he declined it, preferring to retain the curacy of his native parish, among the objects that he loved so well, rather than the acceptance of more exalted positions elsewhere.

White was some forty-seven years of age when, on one of his occasional visits to London, he met Thomas Pennant, a naturalist of repute, who was then engaged upon the compilation of a work on British Zoology. A close friendship seems to have sprung up between these two men and they became mutually interested in each other's work. The first part of Pennant's "British Zoology" had been published in the year previous to that in which White met him, and White's frequent enquiries as to its progress show the interest that he took in the work; it was ultimately completed and ran into several editions. Pennant, too, was anxious that White should publish the results of his observations, and it is doubtful whether they ever would have seen the light of day but for this encouragement.

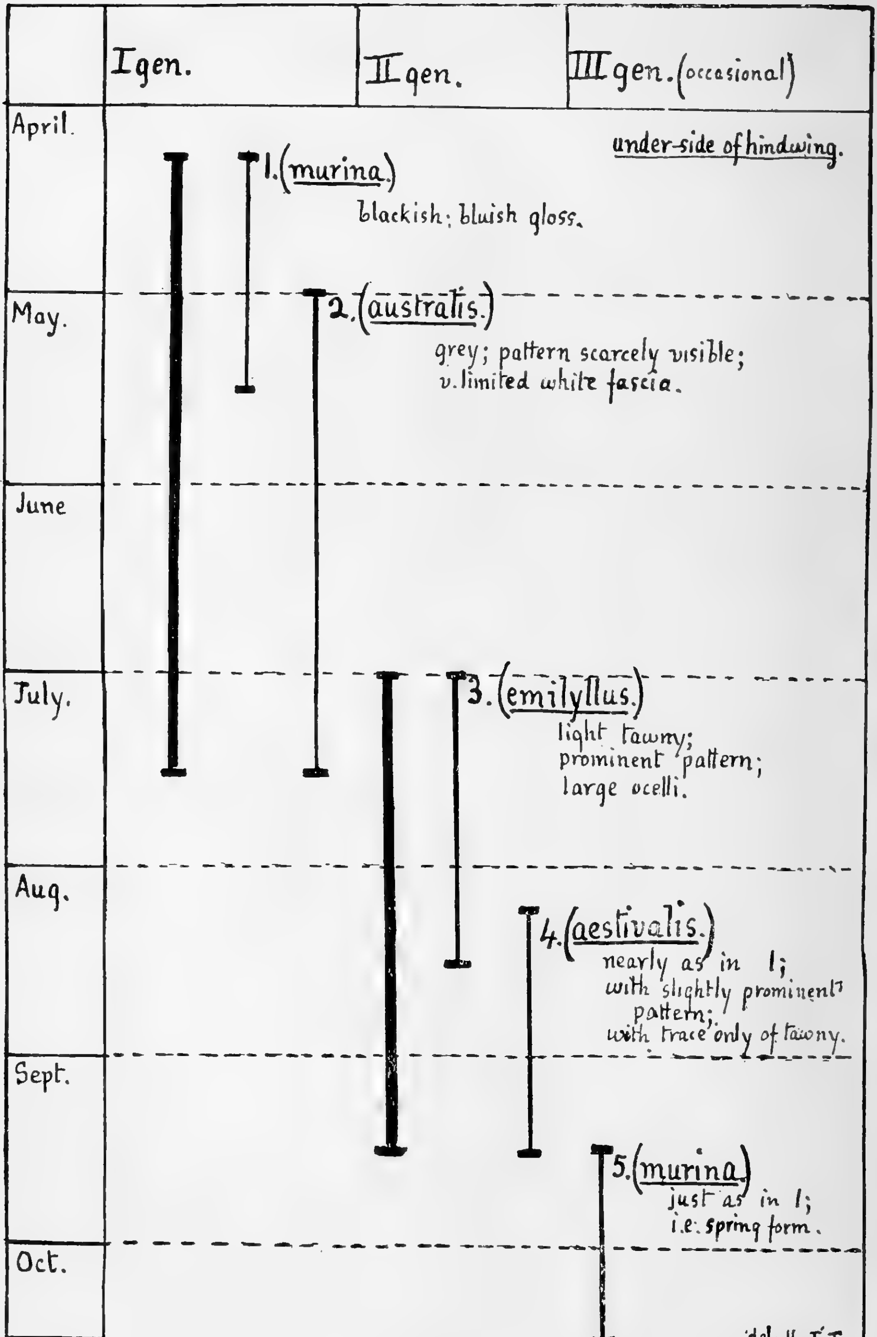
Gilbert White will be best remembered by his book "The Natural History and Antiquities of Selborne," published in 1789. In its preface the author says, "If the writer should at all appear to have induced any of his readers to pay a more ready attention to the wonders of the Creation, too frequently overlooked as common occurrences; his purpose will be fully answered." To this the best answer is the huge number of editions through which his book has passed, and its popularity even in the present day, some hundred and thirty years after its first publication. No one will claim for it that it is a highly scientific book, judged by modern standards. White was a simple-minded man, and he put his observations and facts before us in that simple-minded manner that we can all understand; and it is this simplicity that has so endeared his writings to us.

Perhaps it would be difficult to find two men of more diverse characters than John Ray and Gilbert White; yet I have no hesitation in saying that these two old naturalists have done more to foster the study of natural history in this country than any others, and their names will not be forgotten.

What more fitting memorial to their work could be devised than, as in the case of Linnaeus, the establishment of a society bearing their name, or a title indicative of their connection with it. Thus in 1844 was founded the Ray Society, its object being to publish the important work of naturalists that would not otherwise see the light of day. The society has been faithful to its creed, and each year since its establishment has presented to the members, in exchange for their very moderate subscriptions, a volume or volumes of considerably greater value. Among these works have been included monographs by the best men of the day on a multiplicity of subjects connected with natural history, all beautifully illustrated, too bulky for the transactions of the learned societies, too expensive of production for the ordinary publisher. Work in which, I doubt not, old John Ray would have delighted. The Ray Society deserves the support of every naturalist worthy of the name.

The Selborne Society has very different objects. It takes its members for rambles through Nature's haunts, it lectures to them on natural history subjects, it has established a bird sanctuary, its object is to popularise the innocent study of Nature just as Gilbert White did so much to foster it. The more recently established Gilbert White Fellowship deals more particularly with the Antiquarian side.

But I have already touched upon the domain of the nineteenth century, that period in which such vast progress was made in natural science. That period in which old John Ray's lament is no longer necessary:—"I wish men would be so equal and civil, as not to disparage, deride, and vilifie those studies which themselves skill not of, or are not conversant in"—(he was of course speaking of the study of natural history)—"no knowledge can be more pleasant than this, none that doth so satisfy and feed the soul." And so we may here bid adieu to our ancient naturalists who have done so much for us.



Races of C. pamphilus near Florence.

Coenonympha pamphilus, L.

By Hy. J. Turner, F.E.S.—*Read October 11th*, 1923.

Pre "Systema" History.—Three hundred and twenty years ago (1602) Aldrovandus, in Bologna, described this butterfly in the following words:—"Septimus corpore nigricat, alas habens luteas ad ferrugineum nonnihil vergentes, et ferrugineis venis distinctas. In exterioribus macula est nigra, rotunda, puncto intus albo. Idem est, qui octavo loco depingitur erectis alis, quae eundem plané colorem retinent, praeterquam ubi corpori iungunter, qui parte ad ceruleum vergunt, habentq; lineam, albam, que medias percurrit." And on plate 10, figs. 7 and 8 gave a very crude, but recognisable, representation of it.

In Moufet's "Theatrum," published in 1634, in the reign of Charles I., I have been unable to find any reference to it, but in 1667, in the curious and very rare little work by Christopher Merritt, entitled "Pinax Rerum Naturalium Britannicarum," on p. 199, we may, I think, assume that the description, "8 Alis omnibus pallescente flavo nitentibus," refers to *C. pamphilus*.

From about 1690 to 1720, Petiver, a London druggist, was collecting natural curiosities from all parts of the world, and issuing, at short intervals, leaflets briefly describing them, and also figures, often copied from contemporary publications, in a more or less crude fashion. In his "Musei Petiveriani Centuria Quarta," the first 30 of which describes some of our English Butterflies, no. 311 is "Papiliunculus aureus oculatus, in Ericetis frequens. The small Heath-Butterfly. Common on heaths from May to Autumn."

In 1710, or rather some years previously, John Ray, in his "Hist. Ins.," described "the Small Heath Butterfly" as follows:—"Papilio parva é fulvo et fusco bicolor, fulvo mediam alam, fusco oras extremas occupante, cum ocello ad extimum angulum alarum exteriorum. Papiliunculus aureus occulatus in ericetis frequens." He gives as a reference Petiver's "Musei," which is quoted above.

His expanded description reads, "Ocellus in prona praecipuè alarum parte cernitur, è duobus circellis, exteriore albido interiore nigro cum puncto albo pro pupilla in centro compositus. Alarum interiorum prona superficies triplici colore insignis est, ab exortu ad medium ferè fusco, deinde macula albida, tum cinereo obscuriore, tandem ad margines clariore. Extremus etiam margo supinae superficies utriuslibet alae cinereus." To which he adds that they are, "In pascius frequentissimae sunt per totam ferè aestatem."

In 1717 Petiver issued a folio leaflet of two pages, on which he described somewhat more fully the large number of figures, showing male, female and underside, contained on six plates accompanying the leaflet, of no fewer than 80 species of "English Butterflies." On Plt. V., figs. 15, 15p, 16, 16q, are illustrated two forms of our species, the ordinary and the blackmargined and their undersides. The figures are quite good for the time. The letterpress reads—"15, Golden Heath-eye. Papiliunculus aureus oculatus in Ericetis frequens, Mus. nost. 311. Ray, 125-19. Very common on heaths, from May till Autumn. 16. Idem margine fusco. Selvedg'd Heath-eye. Differs from the last, in having a brown brim or edge, and found with it." We may, I think, consider 15 as the ♀ and 16 as the ♂.

In 1730 a work, the "Ins. Eur.," by Madame Merian, was issued in Amsterdam, and on plate 154 is a quite recognisable figure of *pamphilus*, but the letterpress gives no details of the figure, nor does the gifted authoress, in her work on the larvae, refer to this species, which is rather remarkable.

From 1740-1746 L'Admiral, a Dutchman, chronicled his observations and breeding experiments in a series of notes with plates of figures, more or less roughly engraved and coloured. On the last plate, xxv., is figured an upperside with very dark and wide margins, an underside of which the hindwing is extremely dark black-brown with a somewhat light fascia, suggestive of an extreme form of the early brood, and two figures of the larva quite appreciative of the slight taper to head and anal extremity, the latter showing the peculiar characteristic points directed backwards.

On page 24 the "Een-er-vyftigste," or "Het Hooy-Beestje," is described, and the author adds a most interesting record of the breeding of both broods. August 19th, ova laid; August 30th, hatched; September 14th, 1st moult; September 22nd, 2nd moult. Then hibernation. March 1st, recommenced feeding; April 15th, last moult.

Of the 2nd brood. May 28th, ova laid; June 9th, hatched; June 23rd, 1st moult; July 4th, 2nd moult; July 21st, 3rd moult and last; August 3rd, started to pupate; August 5th, pupation completed; August 20th, imago emerged. This careful recording for so long ago as 180 years is quite remarkable.

For a good recognisable early figure of the larva we are indebted to Rösel, who figures it on plt. 70, fig. 6b of Vol. III. of his "Ins. Belustig," about the year 1755.

THE SPECIFIC NAME.—In 1758 Linné, "Sys. Nat.," ed. x., Vol. II., p. 472, describes and names this species as "Papilio Danai alis integerrimis fulvis: subtus primoribus ocello unico; posticis fascia alba."

His references are to (1) his own "Fn. suec.," 1746, where it was called *tityrus*; (2) Petiver's "Musei"; (3) Ray's "Hist. Ins."; (4) Mad. Merian's "Europ. Ins."; and to Rösel's "Ins.," and leave no doubt as to identification.

He adds "Sexus alter minor. Alis posticis subtus ocellis 6; primo majore," and "Habitat in Europa."

In 1761 Linné, "Fn. Suec.," ed. ii., alt. auct., p. 273, adds the following:—"*Descr.* Rai descriptio bona est. Alae suprae fulvae margine subfusco, subtus cinerascentes; Ocellus in ala primaria subtus unicus est et niger puncto albo annuloque nigro. Alae secundariae subtus cinereae; antice obscuriores; in medio fascia pallida et ocellis obliteratis quatuor notatae."

In the same year Poda published his "Ins. Mus. Graec.," describing this species under the name *menalcas*. His description reads, "alis ecaudatis flavis limbo fuscescente, primoribus concoloribus supra ad apicem puncto nigro; subtus ocello unico."

Two years later, in 1763, Scopoli issued his "Ent. Carn," and used Poda's name.

The following year Geoffroy called it "le procris" in Vol. II. of his "Hist. Ins. Paris," and G. F. Müller in Denmark, "Fn. Ins. Frid," uses Linné's name.

But Hüfnagel, in 1766, in a "Tabelle" of the Butterflies found near Berlin, describes the species in the "Berlin Mag." under the name *nephele*.

Subsequent to this all our authors use the Linnean name *pamphilus*, except Rottenberg, in the "Naturforsch.," in 1775, when he reviews and revises Hüfnagel's "Tabelle," Borkhausen in his "Nat. Eur. Schm.," in 1788-9, where he heads his description with the name *nephele*, although, strangely, in the text he invariably calls it *pamphilus*, and Hübner, who names his figures, 237-239, *nephele* (1799). In a subsequent fig. 557-8 (1804), Hübner uses the name *pamphila*.

The Genus. Historical.—In "Sys. Nat.," ed. x. (1758), Linné placed *pamphilus* in his group *Papilio Danai Festivi*, the butterflies with "Alis integerrimis variegatis" next to *hyperantus*. In ed. xii., 1767, of the "Sys. Nat.," Linné removed it to his *Papilio Plebeii Rurales*, distinguished as being "parvi: Larva saepius contracta. Alis maculis obscurioribus," near to *rubi*, *argiolus*, and *arcanius*.

In his "Sp. Ins.," 1781, Fabricius restores it to the P.D.F. of Linné and places it next to *arcanius* and near *hyperantus*. In 1793, in his "Ent. Sys. Emend. et Auct.," which we may look upon as the first step in the dawn of modern genera, Fabricius put *pamphilus* in his 8th Phalanx, which he called *Satyri*. In 1805 Latreille, in the 14th vol. of his "N. H. Crus. et Ins.," put the whole of the Butterflies (*Papilio*, Lin.) into seven genera, of which *Nymphalis* was one. This he subdivides as Nymphalis proper, Perlati and Satyri (Fab. term), citing *pamphilus* in the last.

Fabricius, however, in his "Sys. Gloss.," threw over his previous term *Satyri* and substituted *Hipparchia* as a genus name for some 119 species of the group of which *pamphilus, hyperanthus,* etc., were members. See "Illig. Mag.," 1807, where a summary of the 42 genera described is given.

Almost immediately after this, in 1807, Ochsenheimer brought out the 1st volume of his "Schm. Eur.," and used the new Fabrician genus name *Hipparchia* for some 60 European butterflies, but grouping them into seven sections, of which *pamphilus* is in the last, with *davus, lyllus, iphis, hero, oedipus, arcania, dorus, satyrion, corinna, leander,* and *phrynne,* forming a group of species almost as we have them to-day. Leach followed with *Hipparchia* in a similar sense in the "Edin. Ency.," Vol. IX., in 1815. In 1816 Dalman, in his Classification, placed these species, so far as they were known to him in the far north of Europe, in his genus *Erebia, pamphilus* being placed in the second section of "oculis nudis."

Finally, in Hübner's "Verzeichniss," in that portion published about 1818, *pamphilus* is placed in the genus *Coenonympha* with *arcania, tiphon, leander, corinna,* etc., as those species, decorated with a shining line near the border, belonging to the Family *Fimbriatae,* the lower wings of which were metallic coloured near the border, the 8th of the Stirpes *Oreades* (Gemmati of Linn. and Satyri of Fab.), characterised by having wings more or less marked by eye-like, black, white-centered spots.

Early Figures and Items of Interest.—Lewin, in the "Ins. Gt. Brit.," 1795, on plt. 23, gives a good figure of a male upperside of the form with only a slight dark line margin to the wings. But the interesting point about the figure is that the hindwing on the upperside has three small black dots, in the position 4.5.6., while on the underside of the same wing there are five well-formed pupilled eyes, in positions 2.3.4.5.6. These latter eyes are placed in a band of dark shading, inside of which is a pronounced light band, and outside of which is a narrow similarly light band. The basal half of the wing is clearly cut off from the light band, and is of a very dark brown, with a greenish tinge over the inner two-thirds. Lewin says that the species has two or three broods.

Stephens, in his "Illustrations," 1828, notes that the male is usually of a deeper hue, and the wings are more distinctly edged with dusky above, and gives var. β., with the apical ocellus on the anterior wings totally obliterated, and var. γ., with the posterior wings beneath of a uniform greenish-brown, the band and ocelli being obliterated; but he does not note differences in the broods.

Sepp, in "Ned. Ins.," Vol. IV., p. 80, plt. 26, treats of the "Hooibeestje," and figures the ♂, ♀, und., larva, pupa, and ovum (mag.) all on grass. The ovum is not good and the imagines have no dark margins to the wings. The author refers to the work of L'Admiral.

Godart, in "N. H. Lep. Paris (Fr.)," Vol. II., plt. 20, 9-10 (1822), figures the form *lyllus*, probably the 2nd generation form from S. France. The underside shows pupilled eyespots, nos. 3, 4, 5, in the dark submarginal area between the somewhat lighter fascia and the lighter narrow margin. There is a general absence of marking below. The form is a not strongly expressed *lyllus*.

Zetterstedt, "Ins. Lapp.," 1840, refers to one brood only in the far north, where it is rare, although more frequent in Sweden. He states that the hindwings are without spots.

Doubleday and Hewitson, "Gen. Diur. Lep.," 1851, Vol. II., state that the genus is well characterised by the "strongly swollen condition of the base of the three principal veins of the forewing, the entire margin of the wings clothed with long fringe, eyes naked, etc."

In 1852 Freyer, in "Neu Beitr.," Vol. VI., plt. 499, fig. 1, gives a figure of a remarkable form to which subsequently the name of *thyrsides* was given by Staudinger, from its resemblance to the Candian species *C. thyrsis*. The specimen has light yellowish brown ground, dark margins, light fringes, four ringed spots on the hindwing above in positions 4, 5, 6, 7, all the same size and without pupils; the underside hindwing has six white pupilled spots (no anal spot), all outside the light transverse band in positions 1, 2, 3, 4, 5, 6. The ground is pale grey with a slight yellowish tinge, and has a very pale band across the disc, the inner edge of which is darkly bordered by a fuscous shade fading away towards the base. The forewing below has a well-marked, pupilled apical spot, with ground colour as above, but much lighter towards the apical part of the costa; the marginal line is silvery at the apex, but becomes very dark and widens towards the anal angle. There is a transverse line outside the discal cell not reaching costa and inner margin.

Nolken, in 1867, "Lep. Fn. Est. Liv. Kur.," says that *pamphilus* occurs throughout the whole summer, certainly in two generations, in the neighbourhood of Riga.

Variation.—The elements available for variation in *C. pamphilus* are as follow:—Upperside, 1. Ground colour; 2. More or less dark scaling around the margin; 3. Apical ocellus; 4. Tendency to dark scaling at the base of the wings. Underside, 1. Ground colour of forewing; 2. Ground colour of hindwing; 3. Apical ocellus; 4. Slight light fascia on f.w.; 5. More or less strong white fascia from the costa h.w.; 6. Points or ocelli on the hindwing; 7. Scalloping of the h.w.; and 8. Colour of the cilia. The variation is extensive but not striking.

The lines which the variation takes are:—

1. The males are slightly darker in ground colour than the females, and have a tendency to a pronounced marginal darkening.
2. The females are the larger and frailer looking.
3. According to C. G. Barrett the specimens from elevated locali-

ties in the British Isles are somewhat darker generally than those taken in the lowlands. Is this common observation?

4. The ground varies from a reddish fawn colour to a yellowish fawn, and an extremely pale yellowish-tawny form is known as ab. *pallida*, Tutt.

5. Forms in which the "black marginal pattern of the upperside is extremely indistinct, of a very pale grey, or even absent," is called ab. *detersa*, Verity. On the other hand, specimens in which the brown border is pronounced or extended are known as ab. *marginata*, Rühl, the brown margined forms of the extreme Southern Group, *lyllus* of Asia Minor, etc., as ab. *latenigrata*, Vrty., the still darker bordered forms of the Southern Europe Group, *australis*, and as ab. *latevittata*, Vrty., the extreme dark bordered southern form found in Algeria alone.

6. The apical spot on the forewing may be pupilled, large and very prominent, even doubled, when it is called ab. *bipupillata*, Cosm., or it may be small, not pupilled, or even absent (ab. *obsoleta*, Tutt). Invariably the apical spot is present on the underside, generally well developed, and always pupilled. The light ring around the ocellus is frequently missing.

7. Behind the apical spot below a light fascia is frequently developed, and occasionally very prominent, although it is often absent, particularly in the males.

8. In all the races of *C. pamphilus*, from Northern, Central and Southern (not extreme Southern) Europe, there is a more or less strongly marked light fascia from the centre of the costa of the hindwing underside, very variable in size, outline, length, and intensity.

9. The races belonging to the Group *lyllus*, Esp., found in Portugal, the extreme Southern parts of Europe, Sicily, Sardinia, etc., Asia Minor, Algeria, are characterised by (1) the marginal band of the upperside being divided into a marginal and premarginal one by a narrow strip of the ground colour, this is more prominent on the underside; (2) the underside of the hindwing is of a pale buff, mixed with brownish somewhat in the male, and of entirely different aspect to any form of the northern races; (3) a sharply defined transverse band on the hindwing below, with distinct outline on a lighter diffused area. In the ♀ this last is sometimes quite inconspicuous, the wing being uniformly very pale buff (ab. *torrida*, Vrty.). The corresponding form of the northern races in which the underside of the hindwing is of a unicolorous reddish-brown, with no trace of division into basal and outer area, is ab. *unicolor*, Tutt.

In 1902 Lambillion, on p. 11 of the "Rev. Mens." of Namur, described an aberration of which he had captured two specimens in 1899 and 1901, as ab. *havelaarii*. They were both marked irregularly with the colour of "lie de vin très clair," the apical spot was unusually large on the forewing above, of a deep black, and in the large female specimen pupilled slightly with yellow. The female had an almost white costa, and the lower wings were darker than usual; in the male the pale areas were not so well expressed as in the female, and the marginal area was developed dark all round. This aberration is no doubt what we call a xanthic or bleached form.

Staudinger, "Cat.," p. 66, no. 440c., gives the name *thyrsides*, to Her-Schaeffer's fig. 430-1, and adds "al. post. supra subtusque 3-4 ocellis parvis nigris vel albido-pupillatis," with localities Sicily, Dalmatia, Syria, Tura, Taurus. Her. Sch. says, "*lyllus* var. was obtained in Sicily by Zeller, and was a transition from ordinary *lyllus* to *C. thyrsis*; the upperside was very similar to fig. 299 (*thyrsis*), the fringes whiter, the brown band of the margin of the hindwings not so toothed. Below the silvery marginal line was wholly wanting. Verity considers this to be only *lyllus*, so that the name *thysides*, Stdgr., is redundant, unless it be used for the form of *lyllus*, which has unusually prominent spots on both sides of the hindwings.

Spotting.—Now as to the spotting. It has been a tedious business to go through every specimen I possess, some 250, and tabulate these on both surfaces. Added to this, that it is often difficult to decide whether there is a spot or there is not a spot, it being lost in the ground colour, unless pupilled with white or distinguished by a ring of shade. I may note that in numerous examples the pupil is silvery.

Theoretically, seven spots are possible on all wings, although the 7th (anal angle) is never expressed, nor is the first on the upperside of the hindwing. I have seen no specimen of the first on the forewing, although I feel sure that it may exist. It must be noted that the so-called apical spot is the 2nd in the series on both the upper- and underside of the forewings. The position of the spots is determined by the venation, each spot when expressed being midway between the branches.

Analysing the spots I find—Forewing, upperside:—

1. No example seen.
2. Generally present; varies much in size from the merest dot to a large spot; sometimes (rarely) faintly pupilled; occasionally quite absent; often apparently absent, but the eyespot on the lower side shows through; occasionally elongate in shape; often ringed with a lighter shade of ground colour.
3. Occasionally represented by a dot close under 2, or joined to it, since the enlarged 2 has reached the locale of 3.
4. No example.

5. Occurs in one example.
6 and 7. No example.

Hindwing upperside :—

1 and 2. No example.
3. Rarely present.
4 and 5. More frequent; generally together; 3, 4, 5, more often than 4, 5, 6.
6. Less frequent.
7. No example.

Forewing, underside :—

1. Two examples; dot joined above the well expressed 2.
2. Always present and always pupilled.
3. I have ten examples; dot usually united to 2 below.
4. No example.
5. I have eleven examples.
6. One example, pupilled.
7. No example.

Hindwing, underside :—

1. Fairly common; usually not strong.
2. Weakest; often absent; often poorly expressed; rarely equal to the others.
3, 4 and 5. Usually present together and pupilled in majority of cases; pupils may be silvery.
6. Frequently present but often weakly expressed.
7. No example.

In a small percentage of cases there is no trace of the dots, and in a fair percentage there are six perfect eyespots, but even then 2 is the weakest in development, and in a considerable number there are six dots only.

Structure.—The Palpi of *C. pamphilus* were taken as typical of the genus *Coenonympha* by Reuter in his work, "Uber die Palpen der Rhopaloceren," published in Helsingfors, in 1896. On plate 4, fig. 49, he figures the basal joint of the palpus. On page 129 he refers to the shortness of the basal joint, gives the size of the middle joint as $2\frac{1}{2}$ to $3\frac{1}{2}$ times the length of the basal joint, terminal joint long, thin, and pointed. The lower outer side is thickly furnished with fine, long hairs, the inner side with large, wide, oval, adpressed scales, which are not thickly placed. He lays great importance on the "basalfleck," a patch of scales at the base of the basal joint, which he describes at some length and detail, and he endeavours to show that it is of considerable taxonomic value.

There is a very distinctive venation in the *Coenonympha*, which no doubt we have all noted when setting them, and that is the dilation of the base of the lower vein of the cell, as well as that of vein 16 below it.

The Egg.—Hellins describes the egg [" Buckler's Larvae Brit. Butt.," Vol. I., p. 173 (1886)] as " somewhat bucket-shaped, with flattish base and top, and upright sides, broader at the base than above; the sides with nearly 50 small irregular ribs, and faint transverse reticulation, the top thimble-pitted all over, the shell glossy, pale green at first, turning in a day or two to whitish, freckled and ringed with pale yellowish-brown.

Our fellow member, Mr. A. E. Tonge, in 1907, in a little book, No. 15 of " Gowan's Nature Books," gave some beautiful photographs of the male and female and of the eggs in sitû on p. 11, and on p. 66 states, " Eggs upright, somewhat flattened on the top. Pale green or yellow with dark reddish-brown markings, and rather faint ribs. Laid apparently singly on grass."

In 1909 Peyron published, at Uppsala, a very comprehensive and well illustrated work on the " Morphology of the Scandinavian Butterfly Eggs." Text figure 40, on p. 12, gives a profile of the barrel-shaped egg, with the base slightly flattened, the top depressed extensively with the micropylar centre raised above the rim of the depression, and the numerous more or less parallel, vertical ribs indicated by lines. There is also a transverse section, marking 32 ribs. Both figs are much enlarged. On plate 3, figs. 2a, 2b, 2c, show respectively the cellular modification around the micropyle, the change of the network of micropylar cells to the ribbing of the sides, and the character of the branching of the ribs with their less emphasised cross connections. The microscopic structure is described by Peyron in much detail.

Distribution.—This species is found generally distributed from the lowlands up almost to the tree limit, to subalpine heights. Its chief area appears to be almost the whole of Europe, the shores of the Mediterranean sub-region, westward to Portugal, the British Islands, and even St. Kilda, northward in Scandinavia to 66° N., and (St. Petersburg) Petrograd, southward to N. Africa, Morocco, Algeria, Tunis, but not Egypt or Palestine, nor Cyprus, and eastward in Asia Minor, Syria, the Caucasus to the Altai Mts. There appear to be no records of its occurrence in the Amur, West? or N. China? and Japan. In fact we may say that it is spread throughout three subregions of the Palaearctic Region, the European, the Mediterranean and the Siberian, omitting the extreme northern arctic portions.

The variety *lyllus*, the southern summer generation occurs in S. France, Andalusia and Portugal, in Liguria, Sardinia, Corsica, Sicily, Rome, S. Italy, in Brussa, Turkey, Armenia, Beyrout and Diarbekir, and in Algeria. In the Auvergne the summer generation is said to be a gradation, but not fully characterised, *lyllus*.

Racial Variation.—It is quite time now that all entomologists should recognise that there are two groups of variation, the one racial, due to permanent and persistent causes, the other aberrational, due to chance and irregularly occurring causes, often pathological. Of the former group, racial, we must recognise forms that are due to geographical or local influences and forms that are subject to the normal fluctuations of seasonal influences. Thus it will be seen that the variation occurring will be due to the combination of the two sets of influences, of locality and of season.

In the neighbourhood of Florence Dr. Verity, to whom we are so much indebted for the intensive study of our European Rhopalocera, has carefully worked out the generations and seasonal variations of *C. pamphilus*, and shown very conclusively that four or five periods in the year when quite fresh specimens are to be found does not necessarily point to four or five broods in that year. It must be remembered that in Italy there are two periods of more or less effective inactivity, the winter time and the intensely hot summer time. Dr. Verity says [" Ent. Record," Vol. XXXI., p. 71 (1919)], "the first generation of *C. pamphilus* emerges in a very graduated way from about the 10th of April to the end of July; the earliest spring individuals often have a characteristic underside to the hindwings, which are blackish with a bluish gloss (form *murina*, Vrty.); the rest of that brood has a grey colour with scarcely visible patterns and very limited white space (form *australis*, Vrty.). The greatest number emerge in April and May; they then dwindle to very small numbers in June and July. The second generation emerges from the beginning of July until the middle of September; in July and the first two decades of August a very characteristic form is produced, with a light tawny underside, prominent patterns and large numerous ocelli (form *emiylllus*, Vrty.); these consequently contrast sharply with the tardy individuals, of the first generation, which emerge at the same time during July, when they again increase considerably in numbers. At the end of August and in September a reversion to very nearly the same form as that of the first generation takes place, although traces of tawny and a slightly more prominent pattern distinguish most specimens from those of the latter (form *aestivalis*, Rv.). The emergence is very poor. Finally, in October, a very limited emergence of a few individuals often occurs in favourable years, and these resemble the early spring ones mentioned above by their blackish underside (form *murina*, Vrty.)." Probably the relationship of this succession of forms will be better understood by reference to the diagram [Plt. I.]. It will be noticed that names are given to these forms, whether wisely or not I will not say.

Further, Dr. Verity has given us on p. 121 and seq. of the same volume, a scheme of the geographical variation afforded by a study of the races occurring in the strictly European and Mediterranean regions. This scheme may be stated thus :—

A. One Generation only. Group, *pamphilus*, L.
Race *scotica*, Vrty. Scotland and extreme N. of Europe.
Race *pamphilus*, L. Northern Europe generally.
B. Two Generations. Group, *pamphilus*, L.
Race *pamphilus*, L. Northern part of Central Europe.

Group, *australis*, Vrty.

Race *emiaustralis*, Vrty. II. gen., *aestivalis*, Rocci. S. Cent. Eur. and elevated S. Eur.
Race *australis*, Vrty. II. gen., *aestivalis*, Rocci. S. Europe.

Group, *lyllus*, Esp.

Race *lyllus*, Esp. I. gen., *lyllides*, Vrty. Portugal and extreme S. Europe.
Race *gigas*, Vrty. Sicily.
Race *marginata*, Rühl. Asia Minor.
Race *latevittata*, Vrty. Algeria.
Race *torrida*, Vrty. Sardinia.

There are other races each with their individual characteristics, which can easily be fitted into a scheme of this kind. It must be remembered that these names do not represent individual specimens, but an average sample of the product of the locality in which the majority of the individuals show the characteristics, more or less, of the race in question.

Bibliography.—*Pre-Linnean References.*
1602. Aldrovandus, " Phil. and N.H. Ins.," p. 250 (p. 100), plt. 10, figs. 7-8.
1667. Merritt, " Pinax.," p. 199, no. 8.
1695. Petiver, " Mus.," p. 34, no. 311. Small Heath Butterfly.
1710. Ray, " Hist. Ins.," p. 125, no. 19.
1717. Petiver, " Pap.," p. 2, plt. 5, figs. 15, 16.
1730. Merian, " Ins. Eur.," plt. 154.
1746. l'Admiral, "Naaaw-waarne," etc., p. 24, plt. XXV. Imago up. and und. and larva.
1746. Linné, "Fauna suec.," no. 789. *tithyrus.*
1755. Rosel, "Ins. belust.," Vol. III., p. 422, plt. 70, fig. 6, larva.
Post-Linnean References.
1758. Linné, " Sys. Nat.," ed. x., Vol. II., p. 472, no. 86.
1761. Linné, "Fn. Suec.," ed. ii., alt. auct., p. 273, no. 1044.
1761. Poda, " Ins. Mus. Graec.," p. 78, no. 50. *menalcas.*
1763. Scopoli, " Ent. Carn.," p. 175, no. 458. *menalcas.*
1764. Geoffroy, " Hist. Ins. Paris," Vol. II., p. 53, no. 21. *procris.*
1764. Muller (O.F.), " Fn. Ins. Frid.," p. 33, no. 312.
1766. Harris, " Aurelian," p. 44, plt. 21, figs. g-h.

1766. Hufnagel, "Berlin Mag.," Tabelle, Vol. II., pt. 1, p. 78, no. 43. *nephele.*
1767. Linné, "Sys. Nat.," ed. xii., Vol. II., p. 791, no. 239.
1769. Schaeffer, "Icones.," Vol. II., plt. 164, figs. 2-3.
1771. De Geer, "Mem. Hist. Ins.," Vol. II., pt. 1, p. 205, no. 9, plt. ii., fig. 4.
1773. Gronov, "Zoophyl.," p. 193, no. 763.
1774. Müller (P.L.S.), "Natursys.," p. 626, sp. 239. (C.L.v.).
1775. Harris, "Eng. Lepidoptera," p. 4, no. 28.
1775. Rottemberg, "Naturfor.," Vol. VI., p. 10, no. 43. *nephele.*
1775. Fabricius, "Sys. Ent.," p. 529, no. 368.
1775. Fuessley, "Verz. bek. Schw. Ins.," p. 31, no. 601.
1875. Harris, "Vade Mecum.," p. 3.
1776. Müller (O.F.), "Zoo. Dan. Prod.," p. 115, no. 1329.
1776. Denis and Schiffermüller, "Sys. Verz. Schm. Wien.," p. 168, no. 14.
1777. Gladbach, "Schm. Eur.," Vol. I., p. 21, plt. 10, figs. 1-4.
1777. Esper, "Schm. Abbild.," Vol. I., p. 282, pl. 21, fig. 3.
1778. Ernst and Engramelle, "Pap. d. Eur.," Vol. I., p. 128, plt. 29, fig. 56 a-b. *le procris.*
1778. Goetze, "Übersetz De Geer.," Vol. II. 1., p. 146 and 427, pl. 2, fig. 3.
1780. Bergstrasser, "Nomenclatur," p. 35, pl. 88, figs. 3-6, pl. 146, figs. 5-6.
1780. Goetze, "Ent. Beitr.," Vol. III2, p. 33, no. 239.
1780. Ernst and Engramelle, "Pap. d, Eur.," Vol. II., p. 266, plt. 68 (Sup. 14), figs. g-h, var.
1781. Fabricius, "Sps. Ins.," Vol. II., p. 66, no. 300.
1782. Lang, "Verz. Schm. Augs." (ed. 1), no. 235-236. *le procris.*
1782 ? Esper, "Schm. in Abbild.," Vol. I.2, p. 133, plt. 78 (cont. 28), fig. 4, var.
1783. Retzius, (D.G.) "Gen. et. Sp. In.," p. 32, no. 17.
1785. Fourcroy, "Ent. Paris," Vol. II., p. 240, no. 21.
1786 ? Sepp, "Wond. Gods.," Vol. IV., p. 89, plt. 26, figs. 1-7.
1787. Fabricius, "Mant.," Vol. II., p. 33, no. 348.
1787. Schneider, "Sys. besch. car. Schm.," p. 131, no. 68.
1788. Borkhausen, "Nat. Eur. Schm.," Vol. I., p. 87, 241, no. 24. *nephele.*
1788. Gmelin, "Linné Sys. Nat.," Vol. I.5, p. 2286, no. 239.
1789. Borkhausen, "Nat. Eur. Schm.," Vol. II., p. 206. *nephele.*
1789. Berkenhout, "N. H. Gt. Brit.," Vol. I., p. 129, no. 36.
1789. Villars, "Car. Linn. ent. Fn. Suec.," Vol. I., p. 87, no. 24 ; p. 241, no. 24 ; Vol. II., p. 68, no. 123.
1789. Lang, "Verz. Schm. Augs.," ed. 2, p. 22, no. 143-146.
1790. Rossius, "Fn. Etrus.," Vol. II., p. 146, no. 1000.

1790. Brahm, "Ins. Kalend.," Vol. II., p. 358, no. 239.
1791. Schwarz, "Raupen Kalend.," p. 93.
1792. Petagna (V.), "Instit. Ent.," Vol. 2, p. 450, no. 25, plt. 7, fig. 4.
1793. Fabricius, "Ent. Sys. emend.," Vol. III.1, p. 221, no. 691.
1793. Borkhausen, "Rhein. Mag.," Vol. I., p. 243, no. 27.
1794. Harris, "Aurelian," p. 70, plt. 21, figs. e-h.
1794. Jones, "New Arrang. Pap.," (Linn. Soc.), Vol. 2, p. 63, plt. 1.
1795. Lewin, "Ins. Gt. Brit.," p. 50, plt. 23, figs. 1-4.
1795. Berkenhout, "Syn. N. H. Gt. Brit.," ed. 3, Vol. I., p. 129, no. 36.
1796. Herbst and Jablonsky, "Natursys," Vol. VIII., p. 40, plt. 186, figs. 7-8, plt. 187, figs. 1-4.
1798. Cederheim, "Fn. Ingric. Petropolensis," p. 208, no. 636.
1798. Prunner (de), "Lep. Pied.," p. 23, no. 45, p. 74, no. 154. *gardetta.*
1799. Hübner, "Samm. eur. Schm.," pl. 51, figs. 237-239. *nephele.* Text p. 40, no. 68.
1800 ? Esper, "Schm. in Abbild." plt. 122 (cont. 77), fig. 1. *lyllus.*
1800. Illiger and Haefeli, "Sys. Verz. Schm. W. G.," Vol. II., p. 189.
1801. Schrank, "Fn. Boica.," Vol. II., p. 180, no. 1812.
1801. Loche (de), "Pap. Pied." (Mem. Acad. Torins.), Vol. VI., p. 148, plt. 8, no. 9; p. 146, plt. 7, no. 7. *gardetta.*
1802. Stewart, "El. of N. H. (Sys. nat.)," Vol. II., p. 622.
1803. Haworth, "Lep. Brit.," p. 17, no. 19.
1804. Hoffmansegg, Hübner's figs. ("Ill. Mag."), Vol. III., p. 199. *nephele.*
1804. Hübner, "Samm. eur. Schm.," plt. 109, figs. 557-8. *pamphila.*
1805. Ochsenheimer, "Schm. Sachs.," Vol. I., p. 284.
1805. Latreille, "N. H. Crus. and Ins.," Vol. XIV., p. 105, no. 52.
1806. Turton, "Gen. Sys. Nat.," Vol. II.3, p. 27.
1807. Ochsenheimer, "Schm. Eur.," Vol. I.1, p. 305, no. 66, p. 307. *lyllus.*
1807. Rossius, "Fn. Etrus." (Ill. ed.), Vol. II., p. 229.
1815. Leach, "Ent. (Edinb. Ency.)," Vol. IX., p. 128.
1816. Ochsenheimer, "Schm. Eur.," Vol. IV., p. 23.
1816. Dalman, "Fors. Sys. Upps. Sv. Fjarl.," p. 83, no. 15.
1818. Hübner, "Verz. bekan. Schm.," p. 68, no. 633.
1819. Samouelle, "Ent. Compend.," p. 236.
1819. Godart (Latreille), "Papillons (Ency. Meth.)," Vol. IX., p. 548, no. 178, *lyllus;* p. 549, no. 179, *pamphilus.*

1821. Godart, "H. N. Lep. Paris (France)," Vol. I., p. 176, no. 60, pl. 8, fig. 3.
1822. Godart, "N. H. Lep. Paris (France)," Vol. II., p. 152, no. 58, pl. 20, figs. 9-10. *lyllus.*
1823. Godart, "Tab. Meth. Lep.," pp. 31, 32, no. 81-82. *lyllus* and *pamphilus.*
1827. Jermyns, "Butt. coll. V. M.," ed. 2, p. 26, no. 47.
1828. ? "Brit. Butt.," p. 28, pl. 14.
1828 ? Meigen, "Sys. Beschr. eur. Schm.," Vol. I., p. 153, plt. 40, fig. 4.
1828. Stephens, "Illustrations (H.)," Vol. I., p. 69, no. 20.
1828. Curtis, "Brit. Ent.," Vol. V. plt. 205.
1829. Stephens, "Sys. Cat. Br. Ins.," Vol. II., p. 19, no. 5861.
1829. Boisduval, "Gen. Ind. Meth.," p. 24.
1832. Boisduval, "Coll. Icon. et Hist. Chenilles" (Ramb. and Gras.).
1832. Rennie, "Conspectus," p. 14.
1832. Duponchel, "Icon. Chenilles," (God. and Gras.).
1833. Woods, "Ind. Ent.," p. 6, no. 49, plt. 2, fig. 49.
1834. Ochsenheimer, "Schm. Eur.," Vol. X.1., p. 55.
1834. Cantener, "N. H. Lep. Rhop. Ht. etc. Rhein.," p. 125, plt. 31, fig. 1.
1835. Duncan, "Brit. Butt." ("Nat. Lib. Jard."). p. 207, pl. 26, fig. 3.
1835. Lucas, "Hist. Nat. Lep. Eur.," p. 87, plt. 39. *lyllus.*
1838. Westwood, "Ent. Text-bk.," p. 199, figs. 35-37.
1839. Zeller, "Isis." ("DeGeer's Abhand."), p. 262.
1840. Zetterstedt, "Ins. Lap.," p. 905, no. 17. Northern race.
1840. Boisduval, "Gen. and Ind. Meth.," p. 33, no. 277.
1841. Westwood and Humphreys, "Brit. Butt. and trans.," p. 75, plt. 22, figs. 1-2.
1843. Herrich-Schaeffer, "Sys. Bearb. Sch. Eur.," Vol. I., p. 84, p. 83. *lyllus.*
1844. Duponchel, "Cat. Meth. Lep. Eur.," p. 20. *Satyrus-Dumicoles.*
1844. Doubleday, "List. Lep. Br. M.," p. 141, p. 142. *lyllus.*
1844. Eversmann, "Fn. Lep. Volga-Ural," p. 34. Central Russian form.
1846. Heydenreich, "Sys. Verz. eur. Schm.," ed. ii. (ed. iii., p. 11).
1847. Zeller, "Isis." ("Reise Ital. u. Sicil."), p. 144. Local form.
1847. Tengström, "Bidrag. Fin. Fjar. Fn."
1851. Doubleday and Hewitson, "Gen. Diur. Lep.," Vol. II., p. 398, no. 17. Genus.
1852. Freyer, "Neu Beitrag.," Vol. VI., p. 29, no. 898, plt. 499, fig. 1.
1856. Stainton, "Manual," Vol. I., p. 32.

1858. Speyer, "Geo. Verbr. Schm. Deut.," Vol. I., p. 226. Distribution.
1859. Heinemann, "Schm. Deut. u. Schw.," Vol. I., p. 20.
1859. Tengström, "Cat. Lep. Fenn."
1861. Staudinger, "Cat. Lep. Eur.," ed. i., p. 14, no. 351.
1862. Kirby, "Man. Eur. Butt.," p. 69.
1862. Sievers, "Verz. St. Petro." (Hor-Ross). Russian local race.
1863. Glaser, "Neu Borkhaus." (Hess.-Rhein), p. 19, 45.
1866. Constance, "Cat. Lep. Saone."
1867. Berce, "Lep. Fr.," Vol. I., p 220, plt. v., fig. 17.
1867. Reakirt, "Proc. Ent. S. Phil.," Vol. VI., p. 145. *pamphiloides.*
1867. Snellen, "Vlinders van. Ned. Macro.," p. 53.
1867. Nolcken, "Lep. Fn. Est. Liv., etc.," p. 100, no. 333.
1868. Butler, "Cat. Diur. Lep. Satyridae," p. 44-47, no. 14. *pamphiloides*, no. 15.
1869. Butler, "Cat. Fab. Diur. Lep.," p. 16-17. Systematic Position.
1869. Tengstr, "Cat. Lep. Fn. Fenn.," p. 295. North European Distribution.
1871. Newman, "British Butt.," p. 101, figs. Life-history.
1871. Staudinger, "Cat. Lep. Eur.," ed. ii., p. 32.
1871. Kirby, "Syn. Cat. Diur. Lep.," p. 99, no. 12.
1874. Dubois, "Lep. Belg." plt. 3, p. 83.
1875. Scudder, "Hist. Sketch.," p. 145. Generic position.
1875. Scudder, "Buff. Bull.," Vol. II., p. 243. *pamphiloides.*
1878. Strecker, "B. and M. N. Am. Syn. Cat.," p. 100, no. 333. American subspecies.
1879. Kirby, "Eur. Butt. and M.," p. 42, plt. 13, fig. 8.
1879. Sand, "Cat. Lep. Auvergne," p. 15.
1879. Staudinger, "Lep. Fn. Kln. As." ("Hor. Ross."), p. 289. Eastern Distribution.
1880. Frey, "Lep. Schw.," p. 49.
1880. Wilson, "Larv. Brit. Lep.," p. 18.
1881. Mathew, "Ent. Mo. Mag.," Vol. XVIII., p. 95. Mediterranean race.
1882. Peyerimhoff, "Cat. Lep. Alsace.," 2nd ed., p. 218. ("Bull. Soc. d'H. nat. Colmar.")
1883. Porritt, "List Yorks. Lep.," p. 13.
1884. South, "Ent. Syn. List," p. 2. Adaptation of Staudinger's "Cat."
1884. Lang, "Rhop. Eur.," p. 310, pl. 77, figs. 5-6.
1885. Kane, "European Butterflies," p. 130.
1886. Buckler, "Larvae Brit. Butt.," Vol. I., p. 173, plt. 6, fig. 4.
1888. Aurivillius, "Nord Fjaril.," p. 36, plt. 15, fig. 8.

1889. Dale, "Hist. Brit. Butt.," p. 105. Literary History.
1892. Hoffmann, "Grs. Schm. Eur.," p. 25, plt. 15, fig. 14 a-b (b=*lyllus*).
1893. Barrett, "Lep. Brit. Is.," Vol. I., p. 263, plt. 36, figs. 2 a-f.
1893. Hoffman, "Raup. Schm. Eur.," p. 24, plt. 5, fig. 17.
1895. Ruhl, "Pal. Gross-Schm.," p. 618, 827. Distribution area.
1895. Meyrick, "Hand. Brit. Lep.," p. 341.
1896. Kirby, "Hand. Order. Lep.," Vol. I., p. 225.
1896. Tutt, "Brit. Butt.," p. 421, plt. ix., fig. 1. Variation.
1896. Reuter, "Palpi der Rhop.," p. 129-363, plt. iv., fig. 49.
1899. Lambillion, "Cat. Lep. Belge.," ed. i., p. 9.
1899. Favre, "Fn. Macro-Lep. Valais," p. 53. Swiss races.
1901. Staudinger, "Cat. Pal. Lep.," ed. iii., p. 66. *thyrsides*, etc.
1902. Spuler, "Schm. Eur.," p. 48, pl. 13, fig. 14 a-b.
1902. Robson, "Cat. Lep. North. Durh.," Vol. I., p. 32.
1902. Lambillion, "N. H. etc. Pap. Belge.," Vol. I., p. 174.
1902. Lambillion, "Rev. mens. Soc. Namur," Vol. VI., p. 11. *havelaarii*.
1902. Dyar, "List N. Am. Lep.," p. 30, no. 283. The American representative.
1903. Lambillion, "Cat. Lep. Belge.," ed. ii., p. 27, no. 420.
1903. Wheeler, "Butt. of Switz.," p. 119. Variation Summarised.
1903. Spuler, "Raupen Schm. Eur.," plt. 5, fig. 17.
1906. South, "Butt. Brit. Is.," p. 136, plts. 92-93; p. 136, *lyllus*; p. 137, pl. 92, *ocellata*.
1907. Tonge, "B. and M. and their Eggs," p. 11 and 66. Ova figured in sitû.
1909. Peyron, "Morph. Schm. eier.," p. 62, plt. 3, fig. 2. Egg sculpture.
1909. Seitz, "Mac. Lep. Pal. Reg.," Vol. I., p. 146, pl. 48g.
1910. Ribbe, "Lep. Andalusia" (Iris), Vol. XXIII., Beiheft, pt. 2, p. 173.
1919. Verity, "Ent. Rec.," Vol. XXXI., pp. 69-71, 109-121.

Diacrisia lubricipeda and D. lutea: their History and their Varieties.

By Robert Adkin, F.E.S.—*Read October 25th*, 1923.

It is probable that no two species of the British Heterocera are better known to the average collector than the Buff Ermine, to which we have been accustomed for so long to apply the name *lubricipeda*, and the White Ermine that we have equally well known as *menthastri*. In using these appellations we are now told that we are quite wrong: that we should call the white species *lubricipeda* of Linnaeus, and the buff *lutea* of Hufnagel. Although the reason for this change is not far to seek, the whole situation was so complicated by the writings of sundry authors of a century or more ago, that it now requires some little unravelling.

On referring to the series in the Linnean collection to which the great Swede applied the name *lubricipeda*, we find that it consists of six specimens, of which four are the white species placed side by side, the first of them bearing Linnaeus' label "*lubricipeda*," and below them two of the buff. It also originally contained one specimen of *D. mendica* female, but this has been removed, and several specimens of both the white and the buff species added, but fortunately they are easily distinguishable from the Linnaean specimens.

Turning now to the tenth edition of the "Systema Naturae" (1758), we find the description of *Bombyx lubricipeda* to be, "alis deflexis albidis punctis nigris," clearly indicating an insect with deflexed white wings with black spots. Then follow a number of references to earlier published figures. It is unnecessary to go through these in detail here; suffice it to say that they include both the white and the buff species, while the two that he gives as var. β. (Wilk. "Pap." 20, t. 3, a. 6, and Roes. "Ins. phal." 2, t. 47), are both the buff. In a note, apparently put in as an afterthought, following the description of the larva, he says that var. β. is considered by De Geer not to be a distinct species; and on referring to De Geer (I. t. 11. f. 7-8) we find both species figured, and in the text he says that white males and females and yellow males and females are all one species, and refers to Réaumur's work. In the twelfth edition of the "Systema" Linnaeus also says, "Mas alis flavescentibus." From the foregoing, it will be evident that Linnaeus regarded the white species that we know as the "White Ermine," and the buff species that we recognise as the "Buff Ermine," as one and the same, and he applied the name *lubricipeda* to them. Now that we know that they are not forms of one species but abundantly distinct, we have to decide to which of them his name should apply, and to find another name for the other. This we have no difficulty in doing, for his description in the tenth edition of the "Systema Naturae," "alis deflexis albidis punctis nigris," and the specimen in his series to which his own label is attached, show conclusively that it was the *White Ermine* to which he gave the name *lubricipeda*. Hufnagel ("Berl. Mag.," II., p. 412, 1766) appears to have been the first to regard the two species as distinct. He gives very brief, but sufficient, descriptions of each, calls the white one *lubricipeda alba* and the buff *lubricipeda lutea*. *Lubricipeda* had already been appropriated by Linnaeus for the white species, *lutea* therefore stands for the buff.

Lutea is a descriptive name and well fits the insect to which Hufnagel applied it, and it is worthy of note that no other name has been proposed for this species. *Lubricipeda* literally means "quick footed," and was suggested to Linnaeus, no doubt, by the rapid movements of the larva, which had been so graphically described by Réaumur and De Geer, and might equally well apply to either species. But the white species was to receive many names, thus:—

Retzius ("Gen. Spec. Ins.," p. 37, 1783) gives it the name *lepus*, and refers to *lubricipeda*, L.; but it is to be noted that in his description he says, "albis vel flavescentibus," possibly still regarding the two species as forms of one; or he may have known of the yellowish forms of *lubricipeda*, but as the name *lepus* did not come into general use this is of little consequence.

Esper ("Eur. Schmett.," III., p. 334, pl. lxvi., f. 6 and 7, 1786) gives very good figures of both male and female under the name *menthastri*; and for nearly a century and a half the white species has been known by that name.

Fabricius ("Mant. Ins.," II., p. 123, no. 129, B, 1787) and Rossi ("Fauna Etrusca," II., p. 174, 1790) appear to have regarded it as a form of *mendica*, both applying that name to it.

Marsham ("Trans. Linn. Soc.," I., p. 67, pl. 1, f. 1 [the white species], f. 2 [the buff species], 1791) published an article, apparently with the object of straightening out the tangle of the names of the two species, but unfortunately he only added to the confusion. He says, "Fig. 1, to which I have given the name *erminea*, appears to be the moth which Linnaeus describes in the 'Syst. Nat.' as *lubricipeda*, and to that moth is the name affixed in his cabinet. In the 'Fauna Suec.' the particular description is 'Mas alis flavescentibus,' which is an exact description of fig. 2, to which I have retained the name *lubricipeda*; not only because that name, taken from the motion of the caterpillar, agrees better with this species than the other, but because every author who has figured it since Linnaeus has constantly so applied it, though they have given different names to fig. 1." Thus it appears that, although Marsham knew that Linnaeus' type of *lubricipeda* was the white species, he calls the buff species by that name, and creates a new name for the white species. He also appears to have overlooked the fact that Hufnagel had already named the buff species *lutea*.

British authors of about this period used various names for the two species: thus, Wilkes (1747-60) calls them the Great Ermine and the Spotted Buff; Moses Harris (1766), the Large Ermine and the Cream Dot Stripe; and Haworth (1803) the Large Ermine—*ermineus*, and the Spotted Buff—*lubricipedatus*. More recently we have known them as the White Ermine and the Buff Ermine.

A brief synonymy therefore reads:—

White Ermine.		Buff Ermine.	
Great Ermine, Wlks. ...	1747	Spotted Buff, Wlks. ...	1747
Large Ermine, Harris ...	1766	Cream Dot Stripe, Harris	1766
Large Ermine, Haw. ...	1803	Spotted Buff, Haw. ...	1803
Lubricipeda, L	1758	*Lutea*, Hufn.	1766
Lubricipeda-alba, Hufn....	1766	*Lubricipeda*, var. β.L. ...	1758
Lepus, Ratz.	1783	*Lubricipeda-lutea*, Hufn.	1766
Menthastri, Esp.... ...	1786	*Lubricipedatus*, Haw. ...	1803
Mendica, Fab. and Rossi	1790		
Erminea, Marsh... ...	1791		
Ermineus, Haw.... ...	1803		

Diacrisia lubricipeda, L., (The White Ermine) is a common British species, and has a geographical range extending over practically the whole of the palaearctic area from Britain to Japan, except the polar regions. It has been known to entomologists so long as we have records. Aldrovandus (X., pl. 9, f. 8, 1602) gives a rather grotesque figure, but taken with the context there is little doubt that this species is intended, and the same may be said in regard to Moufet (p. 96, no. 11, 1634). Gödart (I., pl. xxxviii., 1662) gives quite good figures of both larva and imago, but Merian's figures (pl. xlvi., 1679) are hardly so satisfactory. Ray (p. 195, no. 40, 1710) describes both larva and imago, and gives some account of the life-history. Albin's figures (pl. xxiv., no. 36, 1720) of the larva (taken, he tells us, in a garden near Hackney) and of the imago that he bred from it, leave little to be desired. Roesel (I., pl. xlvi., 1746), Wilkes (pl. xl., 1773), and Moses Harris (pl. xxxviii., 1766), all similarly illustrate the species; while Sepp (III., pl. xix., 1786) gives us one of the most beautiful plates that has ever been published, in which he portrays ova, larva, pupa, and imago. Almost every author of the nineteenth century that published plates, included the species in their illustrations.

Variation.—I have already mentioned that the species occurs over the greater part of the palaearctic region. In this country it is to be found commonly from the south coast to as far north as Ross, in Scotland, and throughout Ireland; but so far as I am aware it has not been met with in the Hebrides, Orkney, Shetland, Sutherland, or Caithness. In the north-eastern part of its range—Elgin, Aberdeen, etc.—it runs to a local form in which the ground colour, instead of being white, assumes a yellowish buff, or even deep brownish tinge. In the Isle of Arran (South-west Scotland) and parts of northern Ireland, the prevailing race is of a yellowish buff, similar to the lighter specimens of the north-east Scottish race.

Oberthür (1896, " Et. d'Entom.," XX., pl. xii., no. 221-3, (1911) " Et. Lep. Comp.," VI., pl. cxxii., nos. 1073-8) named the darker forms of the Scottish race *brunnea*, and what appears to represent the lighter of them, *transitoria*; this latter form is also recorded from some part of France, but I have no knowledge of the exact locality where it was obtained, unless it be that referred to by Gödart to be mentioned later on. *Ochrea* (Seitz. " Gross. Schmet.," II., p. 87, f. 15g, 1910) appears to be identical with the above-mentioned forms; the specimens that Seitz so named came from Scotland. *Sangaica* (Walk. " List Het. B. M.," 31, p. 294, 1864) is a sparsely spotted white race that occurs in China and Japan, and is occasionally met with elsewhere aberrationally.

Apart from these local races there are also many varied forms. Of these one of the most striking is that in which the spots, or many of them, are replaced by longitudinal stripes, a radiated form, which we have been wont to call ab. *walkeri* of Curtis; but *walkeri* is not a form of this species, as I shall explain later on. The name by which we should know this radiated form is *godartii*, Oberthur ("Ét. Lep. Comp.," VI., pl. cxxii., ff. 1085-6, 1914).* These forms do not appear to be confined to any particular district. I have specimens from places as wide apart as Wandsworth and Dundee.

Godart ("Lep. France," IV., p. 360, pl. xxxvii., no. 4, 1822) described a specimen that he obtained from near Nancy under the name *luxerii*, as having the forewings of a yellowish-apricot, but his figure strongly suggests a likeness to some of our Scottish forms.

Unipuncta (Strand, " Arch. f. Mathem. og. Naturvid.," XXV., no. 9, p. 23, 1903) has for markings a single spot on the hindwings.

Paucipuncta (Fuchs, " Jahrb. Nass. Ver. Naturk.," XLV., p. 89,

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* *Albiramis* (Strand. N. N. "Hamps. Cat.," III., p. 272, ab. 3, 1910) is described as having the "forewings with the interspaces streaked with black, leaving the veins, streaks in the interspaces, and series of spots on the terminal area white." This and the last mentioned form appear to be very similar, but differ in the ground colour. Oberthur's figures of *godartii* are pale brownish, whereas *albiramis* is white.

1892) has the spots on forewings few and small, and the hindwings with but one.

In contrast with these is *krieghoffi* (Pabst, "Seitz. Gros. Schmet.," II., p. 87, 1910), a very strongly dotted form.

Whether these named forms cover all the varieties that one finds in a fairly representative British series, is open to question. In my own series are two specimens that represent all that now remains, so far as I know, of one of my earliest breeding experiments. In these the forewings are normal, but the spotting of the hindwings is represented by five large black blotches. So far as I remember the whole of the brood were similarly marked. The parent moth was, I believe, taken in the neighbourhood of London, but I have similarly marked specimens in the Scottish series. I also have part of a brood reared by Newman, in which the marginal spots of the forewings are much enlarged and to some extent confluent, giving the insect a dark-bordered appearance. Possibly both these forms may be properly included under the name of *krieghoffi*, but I have so far been unable to trace a sufficiently detailed description of that form to enable me to decide.

Then among minor varieties and aberrations one finds specimens with smoky ground color. I have one, of which the history is unknown, in which this character is rather pronounced, and another from Richmond, Surrey, of a much paler tint. In another specimen the markings of the forewings are represented by two irregular transverse bands, one crossing the wing at about two-thirds of its distance from the base, and the other on the margin ; while perhaps one of the most interesting forms is that in which the spots near the centre of the forewing are gathered up as it were into a marking resembling the "question mark" in *D. lutea* var. *fasciata*, Tugwell, to which we shall presently refer.

Diacrisia lutea, Hufn. (The Buff Ermine), has a geographical range extending over much the same area as *D. lubricipeda*, and is a common species throughout Great Britain and Ireland, except perhaps in the extreme north of Scotland and the northern Scottish islands. It seems to have been known to our forefathers equally well with the last mentioned species; and although Aldrovandus does not, so far as I have been able to trace, figure the imago he gives a representation of a larva that is generally believed to be intended to indicate that of this species (X., pl. 5, f. 4, pg. 108). Moufet (p. 96, nos. 14 and 15) is credited with figuring both male and female, but the representation of the latter is hardly convincing. Godart ("Lister's" ed., no. 93) gives quite a recognisable figure of larva and imago ; and Albin's figures (pl. xxiv., no. 35) compare favourably with those of many of our more recent authors, practically all of whom refer to the species in more or less detail. Albin says, "These caterpillars are very common and mischievous in most gardens; but may be easily shak'd off the *Plants* and kill'd."

Variation in the species takes some very extreme forms; so great indeed is it, that if anyone not well acquainted with the species were shown examples of some of the most marked forms alongside typical specimens, they might well be forgiven for regarding them as distinct species. Yet, if one omits some trivial variations that have recently been dignified by the bestowal of special names, it will be found, I think, that all the more important named forms fall into but two distinct groups, as follows:—

The Zatima group. *Zatima*, Stoll (Cramer. "Pap. Exot.," IV., p. 182, pl. 381, f. F., 1781), is described thus, "Hind part of the wings are almost entirely obscured, with the veins of the wings of the colour of the centre." Such a description may be a little difficult to follow, but it is accompanied by a very good figure, in which we see an insect with a yellowish-buff ground, costa and inner margin streaked with black, and the outer margin also black, except for the well marked wing rays of the ground colour which pass through it; thus a considerable portion of the central area of the wing is left of the ground colour, and on it are two longitudinal black streaks. This latter character, although shown in the figure, is not constant, and possibly for that reason was not mentioned in the description, the disc of the wing often being entirely of the ground colour. *zatima* occurs chiefly in the Island of Heligoland and the adjacent coasts of Germany, but has also been met with occasionally in Britain.

Radiatus, Haw. ("Entom. Trans.," I., p. 336, 1812), is thus described: "Forewings black with a large lobate spot and the nervures yellowish," a description which it will be seen exactly fits *Zatima*. Westwood and Humphrey's figure ("Brit. Moths," I., pl. 18, f. 19, 1843), and Wood's ("Index Entom.," f. 1657a, 1839), abundantly confirm this. The specimen was taken in Yorkshire.

Walkeri, Curt. ("Brit. Ent.," II., pl. 92), is described as having the "Superior wings with the costa and edges of the nervures towards the posterior margin in black, the 5th, 6th, and 7th having spots of buff. Inferior wings with a black spot near the centre, and several upon and near the posterior margin." The figure shows the forewings with black costa and inner margin, three black streaks on the disc and the outer third black, with the buff nervures passing through it. This figure has led to a great deal of controversy: it being held by many systematists that it represents a form of *D. lubricipeda*, L. (*menthastri*, Esp.), while others place it as a variety of *D. lutea*, Hufn. I think there can be no doubt that the latter view is the correct one. The forewings are clearly of the *zatima* form; the black border with the pale nervures passing through it is its most constant character, and one which does not, in my experience, pertain to *lubricipeda*. The only similarity to that species is the spotting of the hindwings, a character which is common to the type form of both species. I think, therefore, we must include this variety among the *zatima* forms. The specimen which Curtis figured was taken near Edinburgh in 1820.

Deschangei, Depuiset ("Bull. Ent. Soc., France," (6), III., p. 78, 1883), has the "wings practically all brownish-black, veins not perceptibly lighter, thorax paler yellowish-brown." All the figures that I have been able to trace, however, show the veins distinctly, and perhaps "not *strikingly* lighter," would be a truer translation. This form is said to occur in the island of Heligoland, and it has also been obtained by selective breeding from the darker of the *zatima* forms.

Totinigra, Seitz. ("Gros. Schmet.," II., p. 85, 1910), is the name applied to "the uniformly dark specimens." In these the fringes are sometimes practically black and the veins hardly perceptible. This form was originally described by Seitz under the name of *unicolor*, but as that name had already been applied to a totally different form he changed it to *totinigra*. So far as I am aware, this form has been obtained only by selective breeding, and appears to represent an intensified form of *deschangei*.

Eboraci, Tugwell ("Entom.," XXVII., p. 205, f. 2, 1894), is a form intermediate between *zatima* and the type, which was obtained by crossing a male *radiata* (*zatima*) with a female *fasciata* (referred to later). The area of ground colour is much greater than in *zatima*, but the costa and inner margin of the forewings are broadly streaked with black, as in that species. The spotting of all wings is more intense than in the type, but they are without the black margins of *zatima*.

Intermedia, Bang-Haas (Standfuss, "Handbuch," p. 306, pl. viii., ff. 11-12, 1896), is very similar in appearance to *eboraci*, but shows slightly more of the *zatima* characters. It was obtained by crossing typical *lutea* with var. *zatima*.

The Fasciata group. *Fasciata*, Tugwell ("Entom.," XXVII., p. 95, p. 205, f. 4, 1894). In this form "the fascia-like lines are considerably increased, so that the fascia is clearly and boldly shown on all four wings; this fascia line is in the distinct form of the mark of a note of interrogation."

Fasciata, Dufrane ("Rev. Mens. Soc. Ent. Namur," p. 50, 1907). "Forewings of a deeper yellow than those of typical females, approaching the shade of colour of the males, having a black band formed of the enlarged spots separated by the nervures. This band commences at the inner margin and reaches the median costal spot, making a very prominent angle (almost a semi-circle)—the lower wings are not marked at all."

Guerini, Lambillion ("Rev. Mens. Soc. ent. Namur," IX., p. 73, 1909). "Forewings.—Similar in colour, median band and marginal markings to ab. *fasciata*, Dufrane. Lower wings.—Similar median band as in the upper wings, but although distinct, less emphasised." Such are the operative clauses in the descriptions of these three forms, from which it will be seen that the only material distinction between them is in the hindwings. Tugwell and Lambillion both mention a well defined fascia, whereas Dufrane describes them as without markings. Tugwell's description was taken from a brood that he had reared from parents presumably from Yorkshire; Dufrane's from a specimen taken in a light trap at Trameries; Lambillion's from one taken at Wyneghen, both in Belgium, I believe.

Specimens showing this "question mark" on the forewings more or less prominently, are met with not uncommonly. I have two in which it is well shown, that were taken some years ago in my garden at Lewisham, and several of Yorkshire origin. In some of them the hindwings follow typical *lutea*, in others they are more blotched, but I take it that we may rightly regard them all as referable to var. *fasciata*. Even in the few specimens that I have from Tugwell's original series there is very considerable difference in the amount and density of the spotting of the hindwings, and it seems, therefore, that this character can hardly be regarded as constant. If that be so, there is no reason for regarding *fasciata*, Tugwell; *fasciata*, Dufrane, and *guerini*, Lambillion, as distinct from one another.

Other named forms.—*Unicolor*, Homberg ("Bull. Ent. Soc. France," V., p. 71, 1907), is described as "unicolorous with one black spot on the costa."

Denigrata, Schultz ("Ent. Zeits.," XXII., p. 183, 1908), as having "The black dots wanting on all the wings except a single one on the costa of the forewings, which stands near the base." The specimen described is a female, and was taken in Silesia; and we are told that an exactly similar female was taken in the neighbourhood of Sneeburg, in 1904. We are not told the position of the one spot on the costa in *unicolor*, but as the one near the base is the most prominent it is probable that these two are alike, and therefore both referable to *unicolor*, Homberg.

Paupera, Hoffmann ("Int. Ent. Zeit.," V., p. 227, 1911), has the "Forewings normally coloured and marked, the hindwings are without any spots on the upperside; they are uniformly yellow without markings." The specimen described was taken in a light trap, in 1907, and another like it in 1910. Specimens with hindwings without markings have occurred from time to time, both in England and in Ireland; but I am not aware that any that would pass for *unicolor* have so far been met with here.

Notes on the Natural History of the N.-W. Provinces of India.

By T. H. L. Grosvenor, F.E.S.—*Read November 8th*, 1923.

In August, 1914, I decided to adopt the prevailing fashion of khaki for men's attire; and after a few months of training in London and on the South and East Coasts, my battalion embarked at Devonport for a destination unknown. Our course lay down the Mediterranean—where submarines chased us in the hope of shortening our trip—and then through the Suez Canal.

We landed at Bombay, and shortly afterwards entrained for Bangalore. The journey south took us through the Western Ghats, a magnificent country, which the slowness of the train up the steep climbs allowed us to enjoy. Butterflies were abundant here, but my ignorance then of the Indian fauna only allowed me to note *Papilio hector* and *Troides minos*. In the limited space of the quarantine area at Bangalore I noted *P. hector*, *P. agamemnon*, *Danaida chrysippus* and its larvae. In the barrack square *Tarucus extricatus*, a species I did not find elsewhere, was in abundance.

For a time on Thursday, the general leave day, I worked Agram Plain. There *Junonia orithya*, *J. lemonias*, and *J. hierta* were abundant, as they are all through India. Among the Papilios *P. agamemnon* and *P. demoleus* flew about the orange tree. *P. polytes* was everywhere, with occasional *P. polymnestor*, *P. aristolochiae* and *P. hector* flying high and practically impossible to capture. Hebbal Camp was a well-wooded area, sandalwood and mango trees mainly, with lantana covered bushes, which last were swarming with hawk moths, chiefly *Cephonodes hylas*, both by day and night, at night accompanied by abundance of *Herse convolvuli* and *Phryxus livornica*. But a certain caution was necessary, for here cobras were very abundant, rearing up and expanding their hoods. Their mortal enemy the mongoose was common, but I never saw one attack a cobra, although I have seen them dragging the dead body away. The chameleon was another interesting find here. At Hebbal I had the pleasure of witnessing a migration of butterflies. They continued passing for several days from sunrise to sunset in countless thousands, while kites flying backward and forwards killed them by hundreds in the day time, the mongoose taking their place in the evening, until at the end of the flight the ground appeared covered with the wings. The species were chiefly the Pierids *Catopsilia* *pyranthe* and *C. crocale*, with a few *Euploea core*, *Danaida chrysippus* and *P. hector*, the last high up as usual. *C. pyranthe* was overwhelmingly preponderate.

A day's leave to visit Bangalore city, its fort and temples, brought to mind Tippoo Sahib, Clive, the sufferings that British troops must have endured of old from heat, unsuitable clothes and disease. Here I made a large bag of common species, at that time prizes to me, including *Jamides bochus*, a miniature *morpho*-like butterfly, occurring in hundreds, *Callosune eucharis*, a Pierid reminding one of our British *Euchloë cardamines* with its orange changed to scarlet, and *Hebomoia glaucippe*, that gigantic "orange-tip," flying around the tops of the mango-trees. Returning through the sandalwood plantation I came upon a clearing in which was a huge banyan tree, over which a *P. hector* flew and swooped down on to a small green daisy-like flower. This was rapidly followed by another, and I subsequently found that this particular banyan was the selected roosting place of this species, although there were plenty of other banyan trees quite near. One day I went to Lal Bagh, some two miles from this clearing, and noticed there a *P. hector* with one of the "tails" deformed and a circular patch missing from the hindwing. That same evening I walked to the banyan tree and caught this identical butterfly, and for the next week or ten days saw it there again and again about 4 or 5 p.m. Strange to say, this was the only spot where I was able to catch *P. hector* during the whole of my stay in India.

Papilio demoleus had the same habit of congregating at night, but this species settles on grass.

Coleoptera were very numerous in the district, especially the Blister-beetles, *Cantharides*. These very striking red-black beetles were in enormous abundance, and wherever there was long grass one could often see 40 to 50 on one stem. Holes in trees produced many Longicorn species, and on the higher branches of certain acacias a beautiful Buprestid, with reddish-brown elytra, thorax and ventral parts metallic green, was to be found. Later in the season another species of metallic golden green occurred. In some cases they were sufficiently numerous to denude a tree of leaves.

When we were moved back to Agram Plain I found *Hypolimnas bolina* extremely numerous, and with it was the celebrated mimic, *H. misippus*. My experience is that however similar the female is to *Danaida chrysippus*, the resemblance does not protect it from the King Crow, for my attention was first drawn to the fact that two species were flying together by the behaviour of these birds. In certain nullahs *D. chrysippus* was flying about in dozens; and I noticed that a king crow, who was sitting in a overhanging tree, would at intervals swoop down and catch what appeared to be *D. chrysippus*. But on looking at the wings that the bird nipped off as it flew back to its perch, I saw immediately that the insect was *H.*

misippus. Thus it appears that protective resemblance does not always protect the object needing protection.

In the Mussulman cemetery, not far from the barracks, large black scorpions could be obtained in numbers by raising the large stones of the tombs, while in the evening they could be found under the electric light standards, apparently attracted by the insects that fell from the light above.

A rather monotonous journey to the other end of India, through hundreds of miles of sugarcane, cotton, and wheat, with only occasional points of interest, as the white minarets of the Taj Mahal near Agra, and Delhi, with its encirclement of temples and tombs. At Burhan, our next camp, the whole country seemed to be nothing but sand and dust, with ranges of salt hills all around, a most dreary prospect, and it was bitterly cold, every piece of vegetation being white with frost at night. Here we made our first acquaintance with that useful, but otherwise most objectionable animal, the camel. The first opportunity of investigating the neighbourhood came on Christmas Day, when I decided to climb the Chala Chita, a rocky hill about 2,000 feet high. Here there was plenty of vegetation and a few butterflies were seen, all Palaearctic species; and right on the top *Argynnis hyperbius* and *Pyrameis cardui.* I found that through a gap in the surrounding hills one came to a river with a ford, beyond which were large fields of mustard swarming with butterflies, among which *Pieris brassicae* and *Gonepteryx rhamni* were by no means rare. Other species seen were *Lampides boeticus*, *Melitaea didyma* race *persica*, *D. chrysippus*, and rarely *Synchloë chloridice*, with an occasional *P. machaon* race *sphyrus.* By far the most common insect in mid-March was undoubtedly *Colias croceus* race *fieldii*, it was in thousands, but I saw no form corresponding to ab. *helice* of the typical race. At Burhan I met with the only Zygaenid that occurs so far south, *viz.*, *Z. cashmirensis*, with six yellow spots on the forewing and crimson hindwings; but I only found one specimen.

Mammals were not numerous as regards species, and jackals, foxes, and hyaenas were all that were noted, the last named being not so common as the others, but caused considerable trouble, as mules were very nervous when one was about and would pull their pegs and stampede across country. Even the diabolical yells of the jackals, on the other hand, caused not the slightest emotion among the mules.

Our next camp was at Jallandhar, an extremely cultivated area, with consequently but few lepidoptera, the butterflies noted being *P. demoleus*, *P. polytes*, *Anaphaeis mesentina*, and *D. chrysippus.*. In December *Colias croceus* was in the greatest abundance in the alfalfa fields, and on Christmas Day, 1918, I found a white form of the female drying its wings. *P. brassicae* was plentiful, and *L. boeticus* was also there. Quite a number of the Sphingid *Manduca strix* were brought to me attracted to light. Here we had a beastie which caused considerable trouble to the troops. A species of *Galeodes*, nocturnal in habit, which crawled into bedding, etc.—was reputed to have a poisonous bite, but more likely the painful irritation was caused by the long and brittle urticating hairs on the legs.

However deficient Jallandhar may have been in butterflies, it was not so in birds. There was a large slaughterhouse near by, one of the foulest spots I have ever had the bad fortune to visit, and here the vultures were so abundant that no cultivation was possible for a mile around. The common kite was also very abundant and the nests could be found in hundreds in the trees of the cantonment. I spent three seasons in examining the eggs, and brought home a number of clutches which are now in the Tring Museum. Usually there were two eggs, occasionally one only, and on one occasion three; they showed considerable variation in size, shape, and markings.

The common white-backed vulture was gregarious at its nesting site, and many hundreds of its nests could be found in a belt of trees between Jallandhar and Phillaur. Considering the nature of the birds their nests are wonderfully clean, and they are placed wherever there is a suitable position. One was not more than eight feet from the ground.

The large Pondicherry vulture is quite different in its habits; and its nest is always built solitarily in the largest tree in the neighbourhood. The birds carry large quantities of boughs, some being as thick as a man's wrist. A nest I climbed up to was placed right at the top of a very large banyan tree. It was carefully lined with cotton, collected in the neighbouring cotton fields, and there was one large white egg. When this was taken the birds did not desert but, after about a fortnight, the hen laid another.

The Egyptian vulture, or Pharoah's chicken, the dirty-looking bird that is to be found in every bazaar, is similar in habits, but its nest is not placed so high as a rule; and two very handsome red blotched eggs are laid.

The peafowl is very abundant in the neighbourhood. It is sacred to the Hindus, partially so to the Sikhs, and hated by the Mussulmans. Anyone with a knowledge of the country around Jallandhar can shoot them, providing they are on a Mussulman's ground, in fact he will invite you to kill them as they are most destructive to the crops. On my arrival in Jallandhar I decided to have a shot at one; but not knowing the language I carefully learned one or two sentences, such as *koi mor dekta?* Armed with this knowledge and a 12-bore, I sallied forth; after going several miles, I put my question to a native, who gave rather a shock by replying, "you bet your sweet life, boss!" As this seemed rather good luck I promptly engaged him as my shikari, and we set forth together. After travelling with him all day without seeing a bird, as we neared home my shikari excitedly pointed out a peacock sitting on a wall; but, as I knew this bird would feed out of my hand, and was the particularly sacred possession of an extremely sacred Hindu fakir, I thought it advisable not to shoot. This inaction did not meet with the approval of my shikari, who gave me the following advice: "You shoot the peacock, and I will put a half nelson on the padre." I discovered later that he had been twenty years in a Canadian lumber camp, and knew no more about peafowl than I did.

Another shikari I had was also rather proud of his knowledge of English: he was alleged to be a Sikh, but judging by his conversation I doubt it; his English consisted of two sentences—"What price one piece peacock," and "What price stick me one pint beer." Still, he was a good shikari, and he always knew where I could get a peafowl or black buck.

The blue jay (*Coracias indica*) was very abundant, in fact it was far commoner about Jallandhar than in any other place where I saw it, and it used to breed all around the bungalows. Beautiful as this bird is one does not appreciate it in numbers. It has the worst cry of any bird I know. Add to this a few koels, brain-fever birds, and a couple of cicadas, and one feels ready to commit murder or suicide. Another bird fairly abundant in this neighbourhood was the grey hornbill.

In May, 1917, we heard rumours that the Mahsuds were raiding in the Dera Jat; and shortly after we were moved north to Tank. The only butterflies I saw in this neighbourhood was *Anaphaeis mesentina*, which was in countless thousands, and all the bushes were quite denuded of leaves. When the butterflies emerged it was like a miniature snowstorm.

We soon moved on from Tank and started marching into Waziristan, a terrible country with barren hills all around. The only way in was up the river beds, which for the greater part of the year are dry, or at most with a small stream. During the rains these will be swollen into raging torrents, washing away camels and mules should these not be got out of the way in time. One of these "spates" was responsible for an entomological disaster.

Our march was towards the Mahsud capital, Kanigaram; but when we arrived at Barwand the Mahsuds decided that they would not have their chief town destroyed, so sent messengers in to arrange a Jirgah. A settlement being arrived at we returned to Haidara Kach to await delivery of the rifles they agreed to surrender. This business took six weeks, which gave me a chance to get after the insects, although my hunting was restricted to the ground within our outlying pickets. Butterflies were extremely scarce, and about all I saw were *Colotis amata* and a *Ypthima*. Birds also were scarce, and all I saw was one Egyptian vulture, which followed us all the way from Tank, so that it cannot be said to belong to the country. A few partridges were flushed; and one or two larks complete the list. Mammals were not abundant, though commoner than birds; rats and mice were observed many times, and porcupines were not rare. The commonest mammal was the hedgehog, and on one occasion I saw some sheep, but they were too far away to distinguish; probably they were markhor.

The whole country however was swarming with locusts, and they had eaten every vestige of vegetation with the exception of the dwarf palms, which were too tough even for a locust. I never saw anything to equal the number of flies; where they came from was a mystery. One can only think that Moses would have been very disappointed with his little Egyptian experiment if only he had seen the flies at Haidara Kach. Directly it became dusk the flies would depart in a mass, their place being taken by mosquitoes.

At the end of six weeks we were quite pleased to receive orders to return to civilization, and after several days marching we once more arrived at Tank. The only incident on the march was a spate just as we were nearing Zam, which caught us unawares, drowning forty mules and about a dozen camels, including the animal upon which I had stacked nearly all the insects I had caught during my stay in Waziristan. The exception was of a few which I was carrying in my haversack; so that out of many hundreds of insects captured in this unknown country, I did not manage to get more than a dozen to England. Further down the Shahar Tangi I found the dead camel with its baggage still intact, but it was now a putrid mass.

Our next move was a change to a paradise after the nearest approach to hell possible on this earth.

Leaving Rawal Pindi we started on a three days' march to Murree. At the second rest camp, Tret, there was a large patch of African marigolds in bloom, and on them there were dozens of *Papilio polyctor*. It was a beautiful sight to see this grand insect flying about everywhere, but as we only stayed for the remainder of the day, I did not get a chance of much entomological work. At daybreak we resumed the march to Murree.

Unfortunately, on arrival I had a month in hospital with malaria, thus missing the best part of the year. As soon as I could get about I started after the bugs. Several old English friends, including *P. machaon*, *R. phlaeas*, *G. rhamni*, and *Aglais urticae*, in addition to many other interesting insects, such as *Satyrus schrakra* and *Vanessa canace*, were flying up and down the khud side: the latter being very difficult to catch, as it always settles on the large boulders and flies immediately a shadow comes near it. Various species of *Neptis* were very abundant with an occasional map butterfly (*Cyrestis thyodamas*).

My great hunting ground was on the lower Kashmir Road, at Sher Gali. On an isolated hill near here were any quantity of *P. machaon* race *sphyrus*. Numbers of larvae were feeding on fennel, which grew abundantly in this district. There were also plenty of

Argynnis childreni, *A. hyperbius*, and *Colias croceus* race *fieldii*. On some of the bushes there was a parasitic growth with little wax-like blooms, which attracted *Epizygaena cashmirensis* in hundreds, but nowhere else could I find any. One of the commonest larvae to be found was that of *Daphnis* (*Sphinx*) *nerii*, which was in hundreds, feeding during the evening on the oleander bushes, which grew commonly in the rivulets. Occasionally the natives would bring me larvae and pupae of the lovely green, long-tailed Saturniid *Actias selene*.

Birds are plentiful, of course, in the vast pine forests, but as Col. Rattray has dealt with this class in a manner that I could not hope to imitate I will leave the matter severely alone. In regard to the mammals: as the winter comes on they are driven down from the higher mountains and come nearer the habitation of man. Jackals and foxes are particularly abundant, especially in the neighbourhood of the incinerators; and occasionally a bear or panther may be found just outside the station. Monkeys are quite common in the pine trees.

By the beginning of November the weather had changed and all the butterflies had gone, and every morning there was ice on the water; occasionally there would be snow. So we once more moved down to the plains, to our old station, Jallandhar. The next twelve months I will pass over as I spent this time on the plains, and there were few lepidoptera to be found, so I spent my spare time searching for birds' nests. The Alexandrine paraquet was extremely abundant, and its nests could be found by looking into the holes of the farash trees. Nearly every hole would be tenanted by a paraquet, little owl, blue jay, or yellow-throated sparrow. The nests of the common squirrel were quite abundant in the bushes, and the young were easily reared and became very tame.

In the April following I managed to get to Pathankôt, the railhead for Dalhousie. This is a damp district where much rice is grown, and lepidoptera swarm. I met with *Delias eucharis* for the first time, but it was very difficult to catch, as it spent most of its time flying around the tops of big trees, and only occasionally condescended to come within reach of a net. *P. polytes* was the only Papilio seen in this neighbourhood, but it was extremely abundant, and I was able to get a few females, which are usually difficult to obtain, their habits being entirely different from those of the males which keep to the open country. The female spends her time secreted in the thickest bushes, and often when located it is a matter of considerable difficulty to get at her. The females here were nearly always the red form. *Junonia almana* was particularly abundant in the rice fields.

In a little piece of bush country I had the pleasure of finding the nest of the paradise fly-catcher. The hen is a very ordinary-looking bird of a pale rusty brown; whereas the cock is a beautiful white, its tail nearly a foot in length. I was only able to stay a few days at Pathankôt, having received orders to proceed to Dunirah, which being in the low hill country was very interesting. Perhaps I found more butterflies here than at any other place, some of the most abundant being *Danaida plexippus* and *D. limniace*, *Euploea core* and *E. mulciber*. Several species of *Lethe*, *Satyrus merula* and *S. schakra*, *Nytha parisatis*, on one bank only; *Charaxes fabius*, *Eulepis athamas*, *Cyrestis thyodamas*; all the *Junonia*, *Vanessa cardui*, *Pyrameis indica*. Among the Papilios *P. polytes* easily led in point of numbers, closely followed by *P. demoleus*, with an occasional *P. helenus*. The dimorphic forms of *P. clytia* and *P. dissimilis*, *P. polyctor*, *P. cloanthus* and *P. sarpedon*; and many species of *Pieridae* and *Lycaenidae* kept one busy.

At the next camp on the Dalhousie Road, *viz.*, Dhar, the leaf butterfly, *Kallima inachis*, was quite abundant, but very difficult to catch. It is very rapid in flight, and when settled it is impossible to differentiate it from its surroundings. I found that by cutting bark from a willow tree and allowing the trunk to bleed for a few days, and then clearing off the swarm of rose beetles, *K. inachis* was induced to sail down to the feast. By this method it is sometimes possible to obtain a couple of dozen in a morning. At this out of the way locality, where I stayed for five or six weeks with four other men, the only white inhabitants, we lived in a tent which we could not all leave at once, otherwise everything would be raided during our absence by wild cats. A larger visitor used to prowl around at night—a panther; and it made such a nuisance of itself in carrying away the dogs of the district that the natives were afraid to be on the road after dusk. Although I saw him several times I never had a rifle with me, so could not get a shot.

Near our camp was a small stream which was a particularly happy hunting ground. In this tortoises were quite plentiful. There was also plenty of shooting in the district, including "chikor" (a species of partridge much resembling the French Red Leg); quails were also in numbers. There were no peafowl to be had here, as this bird is confined to the plains. On the hills around Dunirah there was a species of bramble that I never saw elsewhere; the fruit much resembled a blackberry in shape, but was of a beautiful golden colour. I have often wondered why this fruit is not cultivated in England, for it grows at a considerable altitude and in the winter has to stand frost. As regards flavour, no raspberry or any fruit of the family can compare with it.

To return to the panther: I had made all arrangements to have a shot at it, but on the day fixed I received a telegram from headquarters recalling me immediately. Our journey down in a little charabanc was full of excitement, for it was raining as only it knows how to rain in the Himalayas, and as we were travelling considerably faster than is usual on these roads, two or three times we skidded badly, and once our rear wheels were hanging over the khud with a drop of several hundred feet. On arrival at Pathankôt everything was in a state of excitement. The dâk bungalow was a seething mass of women and children; and we then learned of a native rising, the women and children being refugees rushed up to the safety of Dalhousie. This trouble being settled I decided to apply for leave to go after *Teinopalpus imperialis* and some of the fine *Papilio* and *Charaxes* that live in the Eastern Himalayas. Leave was passed but did not materialize, as the Afghans were marching on the Khyber Pass and had attacked forts and outposts in British territory. We were soon taken to Kohat and on to Doaba, beyond which the Afghans had destroyed the line: consequently we had to get out and walk. The Afghans were encamped around the fort at Thal and had destroyed the Thana and American Medical Mission, and had burned or looted all the stores around the fort. Our job was to relieve the garrison. This, General Dyer accomplished, and the Afghans retreated, leaving all their stores.

The country was perhaps the most uninteresting of any I have ever been in, being covered with dwarf palm. This is an uninteresting monotonous plant, but most useful to the Mahsuds, who use the fronds for making their sandals, roofing their huts, making mats, and also obtain from it a greyish dye which they use for colouring their apology for clothing. The only butterflies seen in the district were a few *Nytha parisatis*, and one *P. cardui*, a rather striking example of homoeosis. The country all around seemed to be destitute of all forms of life, but the little stream beside which we were camped was absolutely teeming with small fish.

After a few weeks we returned to the Aldershot of India, Rawal Pindi, there to await the signing of peace with the Afghans. This also is not a district for the bug-hunter; almost the only butterfly seen there was *H. misippus*, which was absolutely swarming. I spent a considerable time looking for females; but although the males were in hundreds I could not find a single hen. The commonest insect found here was a black and white mosquito; I believe its name is *fasciatus*, but it is the most savage brute I know, and seems capable of penetrating anything in the way of clothing.

In August, we received orders to move up to Dalhousie, so once more we went to Pathankôt, where butterflies were still plentiful, principally *Melanitis ismene*, in the rice fields; so I spent most of my time hunting this insect. It is a most interesting species as almost every underside is different; it is crepuscular in habits, and in the day time is only to be found in the deepest shade; a mango tree growing in a ricefield will be certain to produce at least a dozen. The next five days were taken up in marching to our destination, starting at daybreak we had usually done the day's march by 10 a.m., leaving the rest of the day free. The first rest camp is at Chakki, where butterflies were in countless thousands. Every damp spot would be a seething mass of *Terias*, *L. boetica*, and a species of

Tarucus, with *Catopsilia* and *Hypolymnas*, struggling with the mob. There were also plenty of Black Buck in the neighbourhood and I saw a few Nilghai.

The next day we started the long uphill march as far as Dhar, where *Kallima inachis*, was quite plentiful; but as I could not find a willow tree I was not able to catch any of them. Orthoptera, were abundant, especially the grass mantis (*Schizocephalus bicornis*), and for the first time I was able to get the so-called coffee locust (*Aularches miliaris*), though how it has acquired its English name is a puzzle for there is no coffee grown anywhere in the region. The painted locust (*Poecilocera picta*), although extremely abundant on the plains does not go far up the hills. I only know the native name (ak) of its beautiful food-plant, with silvery grey leaves and bunches of mauve blooms. It exudes quantities of milky sap when injured. It is also the food-plant of *Danaida chrysippus*.

The next day found us still climbing upwards; and once more I arrived at Dunirah. Insects were not so common as when I was here in May, and nothing new was obtained. After leaving Dunirah, the road becomes much steeper, winding round the mountains. At one spot the rocks in the valley have assumed very curious forms, and seen from the road they look like the ruins of a vast cathedral with most of the pillars standing. A little farther up, the road runs along the side of a large overhanging cliff, where there is a notice-board warning travellers during wet weather to keep a look above for falling stones. As one of the recent falls was of many thousands of tons sweeping away the road, one wonders if it is worth while wasting time looking up above.

The next rest camp is Naini Khud, perhaps the most beautiful piece of country I ever saw. The camp is in a round valley with waterfalls and streams, and thickly covered with vegetation. On one of the steep mountain-sides was a large number of monkeys which amused themselves by rolling stones down at passers-by. I did not find many butterflies here, and probably this was due to the fact that the season was getting advanced and the mornings were quite fresh. Men who had been here all the summer told me wonderful tales of the insects seen by them. The Morphos and Ornithopteras must have been insignificant compared with them; but this is a common occurrence where descriptions of insects are made by non-entomologists. The next day we arrived at Dalhousie, but it was too late in the year to be of much use entomologically; and all I found was a few *Catopsilia* sps., a few very worn *Papilio polyctor* and *Chrysophanus pavana*—the last named only just emerging and very variable. I also found a few *Epizygaena cashmirensis*. It was apparent that it was no use going any higher, so I decided to go down, and the Bathri valley which is in Chamba State seemed to be a likely locality. It was a long hard walk to get there, but one was well paid for the trouble. At the bottom of the valley there was a beautifully clear stream with large boulders weighing at least a ton each, the stream forming little cascades and clothed with maidenhair ferns. Butterflies were swarming down here, including *P. glycerion*, *P. cloanthus*, *P. sarpedon*, *P. polyctor*, and of course the ubiquitous *P. polytes* and *P. demoleus*. There were also many species of *Lycaenidae*. In Dalhousie panthers were common, and it was impossible to keep a dog. On one occasion when coming back from the Bathri valley a pariah dog was running just ahead, when something flashed across the path and took the dog right in front of me. The particular panther used to be quite well known, and at night would prowl about the cantonment.

Shortly after, we received orders to return immediately to Pathankôt. Butterflies were scarce here now, and I could get nothing new. We only remained two days, and then moved to Deolali, where I again met my old friend *Papilio hector*. A fortnight later we returned to Bombay, going straight on board the ss. Lancashire; and the last impression of India was the Taj Mahal Hotel outlined with palm trees, and the kites wheeling overhead. Three weeks later I arrived at Devonport and proceeded to London, arriving just in time to be present at the annual variety exhibition of the South London Entomological Society, thus bringing to an end my five years in India: in the capacity, it has been said, of a bug-hunter soldiering in my spare time.

ANNUAL ADDRESS TO THE MEMBERS

OF THE

South London Entomological and Natural History Society.

Read January 24th, 1924.

By Capt. N. D. Riley, F.Z.S., F.E.S.

LADIES and GENTLEMEN, you have just heard the Reports of the Council and of the Treasurer upon the affairs of the Society. Both are gratifying in their evidence of the flourishing condition of the Society and in their promise of continued prosperity in the future.

The past year has not been an exceptionally eventful one for us, but two records at least have been broken, for membership stands now at 225, a figure never before reached, but not, I hope by any means a high-water mark. In spite of this, however, and the slightly increased income of the Society consequent upon it, it has been found necessary to increase the Annual Subscription by a small amount to meet the increase in our Rent. However, I do not think we have any cause of complaint on that score, for judging by the nature of the alterations which we have seen carried out in our Rooms up to the present, alterations which certainly do not in their making add to our comfort, conditions will in the end be considerably better than previously. And here I should like to take the opportunity of thanking especially Mr. Stanley Edwards and his stalwart band of self-sacrificing assistants, who have on more than one occasion assumed the role of furniture movers for the purpose of shepherding to safety, continuously, the treasures of the Society, and preserving them from the devastating advance of the builders. Where will be the ultimate resting-place of our library and collections we cannot yet see, but it is reassuring to learn that sufficient and suitable accommodation in these Rooms will almost certainly be forthcoming.

For the second record that has been broken, I would refer you to the latest volume of our Proceedings. In the words of the Council's Report it is "the most imposing the Society has produced," and is therefore a subject upon which we may rightly congratulate ourselves, especially when we consider the large number of volumes already published, and their valuable contents.

The meetings have been as well attended as ever and we have been fortunate in having a number of very interesting papers read before us. Only in one respect has there been a slight falling off, and that was in the attendance at the Annual Exhibition of Varieties. Of late years, these meetings have tended steadily to increase in size until they became almost unwieldy, and I think in the last meeting we see only a natural reaction; from which I feel sure we shall quickly recover.

We have suffered by death two losses since our last Annual Meeting.

Walter Harry Whiffen passed away at the early age of fifty-eight. Interested in the Lepidoptera principally, he was, however, but seldom seen at our Meetings, although a member since 1887. Those who knew him well knew him as an exceptionally keen. patient and observant field naturalist, untiring and excellent company. What a pity such men do not put their knowledge on paper for the benefit of posterity! His knowledge dies with him; his collections pass into the hands of our member Mr. B. W. Adkin, to whom I am indebted for the foregoing details.

B. W. Neave, died on June 25th last, at the age of seventy-five. A collector in his early days, he was an active member of the Haggerston Entomological Club, and brought together a considerable collection of British Lepidoptera. After his marriage he gave up collecting for many years and his collection was disposed of at Stevens'. On his retirement however in 1912, he took it up again, confining his attention to the Rhopalocera, of which he quickly obtained a large collection, remarkable in that it did not display quantities of extreme aberrations, but consisted mainly of short series of normal specimens from a large variety of localities. I am happy to say that it was very kindly offered after his death, by Mrs. Neave, to the Trustees of the British Museum, who gladly accepted it.

Outside our own immediate circle, Entomology has suffered several severe losses. The saddest of all was the unexpected death, at the early age of 46, of Nathaniel Charles Rothschild. His scientific interests were too varied for us to deal with adequately this evening. We knew him as an earnest student of British and European Lepidoptera, of which he possessed a remarkably fine collection; but it is on account of his work on the Siphonaptera and Mallophaga, work of the highest scientific value, work that has already borne fruit in more than one direction in connection with the stamping out of diseases, more especially plague, that his name will always be honoured and remembered amongst Entomologists. And there was another direction too, in which both his inclination and his position enabled him to do us great service. The preservation of Nature Reserves was always a matter in which he took the greatest interest, and it is to him, and to his love of nature, that we owe a very great deal of the highly successful efforts that have been made in this direction of recent years.

Coleopterists have to mourn the loss of the Rev. W. W. Fowler, whose name to me at least brings remembrances of my earliest entomological experiences, who long before then was the recognised authority on the British species, and whose name will always be one of the most familiar of all to students of that order in these islands. His "Coleoptera of the British Islands," was published in 1886 to 1890, and supplemented in 1913; and he also contributed considerably to our knowledge of many exotic groups.

H. J. Elwes, F.R.S., and William Evans, were both men with a wider range of interest than Entomology. The former devoted himself chiefly to Ornithology, Botany and to the Rhopalocera, acquiring, through his long travels to the most distant parts of the world, an intimate knowledge of the distribution and habits of many rare and little known species. During his life-time he amassed what was probably the finest collection of Palaearctic Rhopalocera in the possession of any private individual; and it had the remarkable distinction of having being almost entirely collected by himself. The bulk of it he was allowed to incorporate personally in the National Collection at S. Kensington, which was thereby enriched almost beyond recognition. The remainder of his collection, especially rich in the Oriental *Hesperidae*, upon which he produced what is still recognised as the standard work, passed shortly before his death into the hands of Mr. J. J. Joicey.

William Evans will always be remembered for his exhaustive studies of the Fauna and Flora of the Forth area. For many years he was one of the Editors of the "Scottish Naturalist" and in that excellent Magazine will be found numerous papers and notes from his pen, chiefly concerning insects, right up to the time of his death.

"Age and Area" and some Rhopalocera.

A little more than a year ago to-night, you decided to do me the very considerable honour of electing me your President. The honour was not of my seeking and its bestowal caused me a very real sensation of pleasure; but yet, I must confess, at the same time, it occurred to me that somewhere in the background was a 'catch.' I realise now what that was. It was the presidential address.

Wondering what I should choose for the subject, chance brought to my hands a book entitled "Age and Area," by the well known botanist Dr. P. C. Willis, and it occurred to me that it might prove of some slight interest to try to apply the theory which he develops under that title, a theory based upon a study of the distribution of plants upon the surface of the globe, in some slight measure to insects.

The theory is not really a new one. As long ago as 1853, Lyell[1] wrote:

"As a general rule, however, species common to many distant provinces, or those now found to inhabit very distant parts of the globe, are to be regarded as the most ancient. Numerically speaking, they may not perhaps be largely represented, but their wide diffusion shows that they have had *a long time* to spread themselves, and have been able to survive many important revolutions in physical geography."

Very many factors indeed are involved in the distribution of an insect upon the surface of the globe. Suppose we assume that a certain distinct species of butterfly arose in distant ages in a certain definite area. If it is dependent upon a particular plant for its food, its distribution, in spite of its powers of movement, will from the outset be restricted to the range of its foodplant. Given a wide range in its foodplant it will yet be limited by climate, by natural barriers such as mountain ranges and seas. Suppose we assume it to originate in the centre of a very large and very uniform area with no restriction or barriers to prevent it spreading, except its own rate of increase and capability of movement, then the only remaining factor will be time. The area it will occupy at any given time after its first appearance will be directly dependent upon the time that has elapsed since that first appearance. Inversely, if we could accurately measure the rate of spread of any species we ought to be

[1] Principles of Geology, 9th edition, p. 702.

in a position to judge its age! What a beautifully simple method of establishing the relative ages of different species.

In fact of course we cannot do anything of the kind. The vast majority of the factors which in the past have directly or indirectly affected the spread of species cannot be ascertained, nor could the effect of their complex interaction be calculated with any degree of accuracy were they known.

Climate and the configuration of the land surface of the globe, and changes in these, have probably been the most powerful factors in the past affecting the spread of insects, both directly and, through their effects upon the flora, indirectly too. In geologically recent times changes of this nature have perhaps become less and less violent, more and more gradual one may assume, allowing a consequently greater stability in insect distribution.

As an instance of manner and rate of the spread of insects to new ground an interesting study is furnished by the island of Krakatau, a small island in the Dutch East Indies lying between Java and Sumatra, 25 miles from each and 11½ miles from the nearest island with vegetation. This island was completely sterilised by the famous eruption of 1883. The flora was completely wiped out, and we may fairly safely assume that the insect fauna perished too, for what was not killed by the eruption must have died of starvation.

Three years after the eruption it was found that 15 flowering plants had re-established themselves; in 1897, 50 were present and by 1905, 137. The insects unfortunately were not examined at the same time.

But in 1908 the island was visited by Jacobson, who made extensive, but not exhaustive collections, which showed the presence of 196 animals. Of these 150 were insects, distributed amongst the various orders as follows :—

Hymenoptera	51
Coleoptera	23
Lepidoptera	10
Diptera	32
Hemiptera	15
Thysanoptera	0
Orthoptera	14
Odonata	1
Neuroptera	1
Isoptera...	2
Aptera	1
	150

Thirteen years later, in 1921, the island was again visited, this time by Dr. Dammerman, who had more time at his disposal than Jacobson, and made more extensive collections. In all he obtained 573 different specimens of animals, of which 441 were insects. They were:—

Hymenoptera	66	
Coleoptera...	115	(400% increase.)
Lepidoptera	84	(840% increase.)
Diptera	54	
Hemiptera...	74	
Thysanoptera	10	
Orthoptera	27	
Odonata	4	
Neuroptera	3	
Isoptera	2	
Aptera	2	

Thus in a period of 38 years 441 different species had been able to make their way across the barrier formed by the open sea, in sufficient numbers to be able to establish themselves and to breed there; an average of about one species per month. But it should be borne in mind that many more species undoubtedly did reach the island during the period, but owing to the absence of suitable conditions there, were unable to establish themselves. This is shown, even after making liberal allowance for the difference in method employed by the two different collectors, and the time available to each of them, by the disparity of their totals. After the lapse of the first 25 years 150 were found, but with a subsequent lapse of only 13 years a further 291 species were added, twice as many again in about half the time.

I think this furnishes a most interesting example of the rate at which species spread in nature. It is of course a case of spreading into a totally untenanted area and therefore a much more rapid process than spreading into an area already occupied by an insect society. But even then the number of species is only a small fraction of the total numbers known to occur on the neighbouring islands of Java and Sumatra. Only 2·5% of insects by the way were wingless.

If we wished to seek another example we need go no further than our own islands, which are separated by an even smaller barrier from the Continent but yet a very efficient one, as is evidenced by the numerous species to be found along the north coast of France but not here, although climatic conditions and vegetation would appear to be eminently suitable to their existence.

There are various methods by which insects can overcome these barriers. First place we should have to give to their own powers of movement, especially flight, a matter on which we need hardly dwell. We see in this country every year instances of spreading in this manner in *Pyrameis cardui*, *Colias croceus*, etc., but unfortunately the extension of distribution thus made by these species does not seem permanent, owing no doubt to the lack of suitable conditions in these islands. They have already colonised all the suitable country attainable by this means. Movement on the surface of the ground, as in the case of wingless insects, is less spectacular, slower, but just as sure, as is shown by the spread of the Eastern Cockroach. Such insects as these, when confronted with a barrier impassable to them must rely upon adventitious methods of dispersal such as transportation upon floating logs or upon other animals, two methods largely responsible for the colonisation of new and isolated areas. But probably the most important agent of recent times, in aiding the dispersal of insects into new areas, is man. We have seen two instances, both almost certainly to be attributed to this agency, in the last year or two amongst the butterflies of this country alone. *Hesperia syrichtus* and *Carcharodus alceae*, both foreign species, the one American, the other continental, and both found wild in Surrey, were almost certainly introduced in the pupal stage with plants. The fauna of Madeira furnishes a very excellent example of the manner in which the range of a species may be extended by man. The Lepidoptera there number altogether some 175 species, and of this total about 10% are with little doubt to be attributed to this agency.

One should be wary of deducing from large and sudden increases in the distribution of any species a rapid power of dispersal. Normally the distribution at the present time of all species would appear to be extremely constant, and probably for many many years the areas of distribution have been fixed within very small limits. Such cases as the spread of *Tortrix pronubana* and of *Plusia moneta*, in the south of England are probably to be attributed to the artificial introduction of the species originally, coupled with suitable conditions. It is mainly when man alters local conditions, and renders them suitable for the introduction of fresh species, no longer suitable for the previously existing local species, that we find cases like those which, during the past few decades, have caused such concern to the American entomologists. One is apt to look upon the introduced species, because of the manner in which it overruns a country, as being in some way more virile than the local species; but probably this is very seldom actually the case. Man has as a rule so altered the face of the land that there are no local species suitably adapted to take advantage of the new conditions, whilst the imported species, in most cases European, has been accustomed to them for centuries, and has therefore a free hand.

So much for the methods of dispersal. It is important to remember that, great as may seem to be the power in certain species at the present time of colonising fresh areas, in the past the conditions suitable for such extension of range rarely existed and that therefore we must assume the dispersal of insects from one place to another to have occurred with extreme slowness.

As the conception of the "Age and Area" theory is based largely on an extended study of the flora of Ceylon, it will perhaps be best to trace briefly how it grew up. There are in Ceylon some 800 species of flowering plants peculiar to and confined to that island, endemics in fact. Now the generally accepted explanation of the occurrence of endemics is that they are species specially adapted to the local conditions. But conditions in Ceylon vary very much from place to place, therefore these endemic species must be specially adapted to local conditions within its area. On closer study, however, this was found not to be the case. The endemics were not as a rule confined each to one spot or small region having special and peculiar conditions, but with few exceptions occupied areas by no means uniform throughout. The endemics occupied however, on the average, the smallest areas in the island, although most numerous in species; those species which also occurred in S. India occupied rather larger areas, those which had the widest range outside Ceylon, on the average also has the widest distribution in Ceylon, but were fewest in number. In fact, there was found to exist, when averages were dealt with, a graduated series, showing at one end a large number of endemic species occupying small areas and at the other a small number of wide ranging species occupying large areas. We have seen that the assumption that the endemics are specially adapted did not hold good. The other explanation of endemics, namely that they are relics, in view of the above facts also becomes untenable, as it can hardly be supposed that there are so very many relics, all in the final stages of extermination. The real explanation, according to Dr. Willis, is a mechanical one, namely, that the area occupied is in direct ratio to the age of the species. The most recent statement of his Age and Area runs as follows :—

"The area occupied at any given time, in any given country, by any group of species at least ten in number [for it is a rule which only applies to averages] depends chiefly, so long as conditions remain reasonably constant, upon the ages of the species of that group in that country, but may be enormously modified by the presence of barriers such as seas, rivers, mountains, changes of climate from one region to the next, or other ecological boundaries, and the like, also by the action of man, and by other causes."

It should be borne in mind that the oldest species in a country are not necessarily those belonging to the most primitive genera. The date of their origin *as species* may be more recent than that of other species (the wide spread species) also occurring in the same country.

In an attempt to test the Age and Area theory in Insects, I have tabulated the Butterflies of Australia, arranging them in 4 classes according to their known range; and it is interesting to find that the figures show just the same relations as we have already seen to exist in the the case of the Ceylon plants. The general conditions throughout Australia, except in the northern districts, are fairly constant. The number of species at present known to occur there is roughly 300, and they are, with the possible exception of the *Papilionidae* and *Pieridae*, sufficiently closely related to come within the scope of the Rule. Taking first the *Hesperiidae* we have, in what we might call Class 1, *i.e.*, those species having a range of over 1500 miles, 4 Endemic species, 9 Wide-ranging species ; in Class 2, species with a range of 1000-1500 miles, 16 Endemics, 9 Wides; Class 3, 500-1000 miles, 16 Endemics again, 11 Wides; and in Class 4, with a range of under 500 miles, 25 Endemics, but only 5 Wides or species also occurring outside our limits. In the *Lycaenidae*, the corresponding figures are Class 1, 13 and 26 ; Class 2, 9 and 9 ; Class 3, 15 and 9 ; Class 4, 20 and 1 ; in the *Nymphalidae, Danaidae* and *Satyridae*, Class 1, 2 and 20; Class 2, 4 and 10; Class 3, 6 and 6 ; Class 4, 6 and 2. And in the *Papilionidae* and *Pieridae*, Class 1, 7 and 9 ; Class 2, 2 and 4 ; Class 3, 0 and 5 ; Class 4, 0 and 0. Adding all these totals together, multiplying each class by its own index number and dividing the total of the resultant figures by the total of the species affected we obtained an index to the average relative rarity of Endemic and Wide species in the following way:—

	Endemics.			Wides.		
	No. of Species.	Class Index.	Marks.	No. of Species.	Class Index.	Marks.
1500 miles or over ...	26	1	26	74	1	74
1000-1500 miles ...	31	2	62	32	2	64
500-1000 miles ...	37	3	111	31	3	93
0- 500 miles ...	51	4	204	18	4	72
Total	145		403	155		303
Average rarity represented by ...			2·8.			1·9.

Or the comparative rareness of the Endemics and Wides may perhaps be better shown by saying that *on the average* the former are 30% rarer than the latter.

The table shows very clearly the heavy grouping of endemic species at the bottom end, *i.e.*, confined to comparatively small areas, and the similar grouping of Wide-ranging non-endemic species at the other end. The rather large group of Wide-ranging species which fall into the 3rd Class (500-1000 miles range) can, I think, safely be attributed to the influx of many Indo-Malayan and Papuan species into the tropical districts of Northern Australia, mostly species of wide distribution outside Australia, reaching, owing to changed conditions in the coastal districts extending from Cape York to Brisbane and even almost to Sydney, the limit of their range. Probably when the distribution of butterflies in the northern and more particularly the north-western regions of Australia is better known, it will be found that the actual distribution of these species is far greater than is at the present known, and they would then be removed to one of the higher classes (1000-1500 or 1500 miles or more). This would largely explain the apparently rather anomalous condition of this group. I attempted to tabulate the species again excluding the northern districts. The results showed several interesting alterations, as the following figures indicate.

Table of Australian Rhopalocera occurring S. of the latitude of Townsville, arranged as in preceding table:—

	Endemics.			Wides		
1500 miles & above ...	24	1	24	21	1	21
1000-1500 miles ...	21	2	42	51	2	102
500-1000 miles ...	31	3	63	20	3	60
0- 500 miles ...	38	4	152	4	4	16

It will be seen that the figures from 0 to 1500 show the arrangement that was to be expected, but above that, the Endemics and the Wides bear an inverted ratio. The explanation is I think very simple. Almost all the Endemics that fall into this class have a range across the southern half of the Continent, some of them extending the entire distance. But the wide-ranging species have invaded Australia from the north and the range is measured mainly in a North-South direction along the East Coast, hence they mostly fall into the next class, whereas it is very probable that they extend for a much greater distance in a westerly direction along the North Coast. Our knowledge of the butterflies of theseregions, however, is at present insufficient to form the basis of a definite statement.

But to return to the Rule. I think we have in these figures an additional example of just such a case as that of the plants of Ceylon, upon which the Rule was originally based. It clearly shows that the explanation of the average small range of endemic species, cannot reasonably be explained by calling them relics, for surely we cannot admit that nearly 20% of the species of Rhopalocera in Australia (the Endemics with less than 500 miles range) are on the verge of extinction. And we know that the conditions are too varied to admit of all of them being special local adaptations. What other explanation have we than that they are the youngest species in the land, those that have had the least time in which to spread? I cannot think of any other explanation, and I must admit that the explanation put forward by Dr. Willis does seem to me to be that which fits the known facts.

Let us now suppose that we accept the Age and Area theory, and proceed to test it in another way. This, owing to the state of our knowledge in insect distribution, I propose to do by examinations by means of families and genera rather than by species. Families are not likely to arrive in any new country *en bloc*, as groups of genera simultaneously, but genus by genus; nor is it likely either that two genera belonging to different families would arrive simultaneously in the same country. Hence we may assume that those families which in any country contain the largest numbers of genera and species in their own circle of affinity, are the oldest in the country. This being the case we should expect to find those families, which are the largest in Australia, to be the best represented on the neighbouring islands, for being the oldest in Australia they have had the most time in which to spread to those islands. Unfortunately for us the Lepidoptera of the neighbouring islands are but poorly known, except in the case of Tasmania, the Monte Bello

Islands off the W. coast of Australia, and possibly Lord Howe Island. Taking the case of Tasmania first, we find the figures are the following :—

Family represented in Australia by (genera).	In Australia (families).	Represented in Tasmania by (families).	(per cent.)	Not represented in Tasmania (families).
1 ...	2	0	0	2
2-5 ...	2	2	100	
6-10 ...	2	1	50	1
over 10 ...	3	3	100	
	9	6	66	3

Or, converting this into terms of genera and species, as opposed to families and genera, for the rule must apply equally well to either case if true of one of them, we obtain the following figures :—

Genus represented in Australia by (species).	In Australia (genera).	In Tasmania (genera).	(per cent.)	Not in Tasmania (genera).
1 ...	39	2	5	37
2 ...	19	2	10·4	17
3 ...	10	2	20	8
4 ...	9	3	33	6
5-6 ...	9	3	33	6
7-10 ...	6	2	33	4
over 10 ...	6	3	50	3
	98	17	17	81

Which shows very clearly the gradually increasing representation of the genera in Tasmania in accordance with their size in Australia.

From the Monte Bello Islands only 8 Rhopalocera are at present known belonging to 5 families and 8 genera, but as the islands have been very thoroughly investigated we may I think take these figures as sufficiently reliable. Tabulating them as above, under genera and species we obtain the following results.

Genus represented in Australia (species).	In Australia (genera).	Monte Bello Is. (genera).	(per cent.)	Not represented in Monte Bello Is. (genera).
1	39	1	2·5	38
2	19	1	5·2	18
3	10	1	10	9
4	9	1	11	8
5-6	9	2	22	7
7-10	6		0	6
over 10	6	2	33	4
	98	8	8	90

From Lord Howe Island, lying 300 miles off the East Coast of Australia, in the direction of New Zealand, some 18 species of Rhopalocera are known, representing all the Australian families except the *Satyridae*, a family whose weak and uncertain flight has probably so far been insufficient to enable the individuals to be carried by the wind to such a distance. The Rhopalocera of this island are distinctly Indo-Australian, none of the species being peculiar to New Zealand. They may be tabulated thus:—

Genus represented in Australia by (species).		In Australia (genera).	Lord Howe (genera).	Lord Howe (per cent.)	Not represented in Lord Howe. (genera).
1	...	39	4	10	35
2-3	...	29	5	17	24
4-5-6	...	18	2	11	16
over 7	...	12	3	25	9

Showing again, but rather erratically, the increase in percentage from top to bottom.

Of these three tables, the first deals with only a very small number of families and genera and hence perhaps does not show as clearly as it should the steady increase in representation in the neighbouring islands, according to size of family, in the way it would if larger numbers were dealt with.

The second and third tables however, show a steadier increase in the proportion of the genera represented in the two islands dealt with, as we pass from the genera containing one species only to those containing a number of species. Thus the prediction that those families which are the largest in Australia would be the best represented in the neighbouring islands is shown to be true; and to be even more clearly shown when genera and species instead of families and genera are dealt with.

The irregularity in the 4th table, that dealing with Lord Howe Island, is, I think, to be explained by the fact that the Butterflies of that island are more closely related to Northern Australia with its large percentage of Papuan and extremely wide-ranging species, than to the more truly Australian fauna of the rest of the Continent. But none the less it agrees with the prediction, but to a less degree. One more case of a similar nature we may perhaps deal with. New Zealand has, lying some way off its coast, several groups of small islands, the whole forming a well defined zoo-geographical region. Now if the Age and Area theory is correct, we should expect to find that those families, which in New Zealand contain the largest number of genera, would be the best represented on these outlying islands, as they have had the longest time in which to spread to them.

Unfortunately for us we are not so well situated for testing these predictions as are the botanists. We only know the Lepidopterous fauna, and that certainly very imperfectly, of one of these outlying groups, The Chathams, whereas the botanists have very complete lists of the flora of the Kermadec, the Aucklands and of Stewart Islands, and also have much more exact data of the range of their species within New Zealand than we have. Hence the few figures I am able to give you this evening cannot be considered anything but provisional and decidedly incomplete. Yet their very incompleteness is not without interest when it is seen that the Age and Area theory none the less holds good.

If we tabulate the families and genera of New Zealand and the Chathams, in the same way as we have already done with those of Australia and Tasmania and the Monte Bello Islands we find once more that those families which are represented by the most species in New Zealand, and therefore according to the Age and Area hypothesis are the oldest there, are also the best represented in the Chathams.

New Zealand families represented by (genera).	In New Zealand (families).	Represented in Chathams (families).	Represented in Chathams (per cent.)	Not represented in Chathams. (genera).
1-2 ...	5	0	0	5
3-6 ...	4	1	25	3
over 6 ...	2	2	100	
	—	—	—	—
	11	3	27	8

And the same feature is shown when we tabulate the same insects by genera and species, although not in so marked a manner. But it must be remembered that our knowledge of the Lepidoptera of the Chathams is still somewhat fragmentary.

Genus represented in N. Zealand by (species).	In New Zealand (genera).	Represented in Chathams by (genera).	Represented in Chathams by (per cent.)	Not represented in Chathams (genera).
1 ...	31	0	0	31
2 ...	10	0	0	10
3 ...	8	1	12·5	7
4-5 ...	3	0	0	3
6-10 ...	3	1	33·3	2
11-20 ...	4	1	25	3
over 20 ...	2	2	100	
	—	—	—	—
	61	5	8·2	

Now tables and statistics of this kind are all very well it may be said, but they are very dull, and quite contrary to the whole spirit of zoology. But when it can be shown how interesting they may prove to be, in spite of the apparent introduction of mathematics into zoology which their employment entails, I feel sure that many workers will take them more seriously. For once you have done the spade work of weighing the evidence, counting and tabulating the families, genera, and species, and measuring their distribution, you have at hand a mass of information which can be used for endless purposes. For example, it is generally assumed that the butterflies of Australia consist of two distinct elements; a strictly endemic element of very considerable antiquity, and a more recent element which has wandered in along the northern coasts, principally by means of the Cape York peninsula. If now we divide up the east coastal strip of Australia, from Cape York to Melbourne, into zones, following the coast line of approximately 300 miles each, and tabulate the endemic species found in those two zones, we find at once confirmation of this assumption. For we find the greatest numbers of endemic species grouped around two points.

Genera.	Number of Species per Zone.						
	0 to 300	300 to 600	600 to 900	900 to 1200	1200 to 1500	1500 to 1800	1800 to 2100
Delias	2	2	3	3	(4)	2	2
Elodina	(3)	3	2	2	2	1	0
Papilio	1	3	(3)	(3)	3	1	0
Hypocysta	2	3	4	(5)	4	2	1
Heteronympha ...	0	0	0	6	(7)	6	1
Argynina	0	0	0	1	(1)	1	0
Oreixenica	0	0	0	0	(4)	1	0
Xenica	0	0	0	2	(2)	(2)	2
Tisiphone	0	1	0	1	(1)	1	0
Cyaniris	0	(1)	0	0	0	0	0
Neolycaena ...	0	0	(1)	(1)	0	0	0
Philiris	1	(3)	1	0	0	0	0
Candalides	1	5	5	6	(6)	6	5
Pseudodipsas ...	1	3	3	(4)	2	2	1
Miletus	1	(3)	2	(3)	2	2	1
Nacaduba	(1)	0	0	0	0	0	0
Neolucia	1	1	1	4	(4)	4	2
Theclinesthes ...	0	1	1	(1)	(1)	1	1
Lucia	0	1	1	(1)	(1)	1	1

Genera.	Number of Species per Zone.						
	0 to 300	300 to 600	600 to 900	900 to 1200	1200 to 1500	1500 to 1800	1800 to 2100
Paralucia	0	0	0	2	(2)	2	0
Pseudalmenus ...	0	0	0	0	1	(1)	1
Ogyris	4	(5)	3	(5)	(5)	4	3
Arhopala	0	(1)	0	0	0	0	9
Ialmenus	1	2	(2)	2	1	(2)	1
Protialmenus ...	0	1	1	(1)	(1)	1	1
Rapala	(1)	1	0	0	1	0	0
Trapezites	3	(7)	6	7	(8)	7	4
Mesodina	0	0	1	1	(2)	1	0
Anisynta	1	1	0	(2)	1	1	1
Oreisphanis ...	0	0	0	0	1	(2)	1
Hesperilla	1	1	0	5	8	(9)	2
Toxidia	2	(8)	6	5	4	3	0
Neohesperilla ...	3	(4)	2	2	0	0	0
Motasingha ...	0	0	0	1	1	(2)	1
Dispar	0	0	0	1	(1)	1	0
Signeta	0	0	0	1	(2)	1	0
Taractrocera ...	2	(2)	2	2	1	1	1
Padraona	2	(3)	3	1	1	1	0
Cephrines	0	1	(1)	1	0	0	0
Telicota	1	2	(2)	2	1	0	0
Sabera	0	(1)	0	0	0	0	0
Netrocoryne ...	0	1	(1)	(1)	1	0	0
Euschemon ...	0	1	(1)	1	0	0	0

If we now mark with parentheses the figure representing the maximum area, that in which most species occur, for each genus, and then count up the number of figures so marked in each area, we find that the maxima are distributed as follows:—

3	11	7	11	17	6	0

Most of them occur in the 5th division, but there is also a subsidiary peak in the second division. If the Age and Area theory is correct this can only mean one thing, namely that the existing endemic Rhopalocera of Australia, or rather of eastern Australia, for we have here tabulated only the endemics of the East coast region, originated principally around two points, the one in the neighbourhood of Sydney (or perhaps it would be wiser to say, in view of the possible incompleteness of our knowledge) towards the S.E. of Australia, the other towards Cape York. As to the origin of the

Eastern elements, I can offer no explanation, although I have often been struck by the similarity existing between many of the species of this group and certain S. American genera and species—a similarity which, however, I regret to say, I have never examined at all closely. The origin of the northern element is of course quite clear. It has been derived from the Indo-Malayan fauna; most of its species belong to Indo-Malayan genera. But it is interesting to note that the greatest number of endemic species in this group does not occur in the extreme north, but not until we have advanced some 300-600 miles S. from Cape York, which seems to indicate a throwing off of a new species by the wide ranging species at about the point at which they began to encounter slightly altered conditions. Whether we explain this process by the Darwinian theory, or by the mutation theory of the origin of species, is not a matter which comes within the scope of this small paper, but it might perhaps be pointed out here, that in such a case as this, the Age and Area theory and the Mutation theory certainly appear to support one another to the detriment of the Darwinian view.

At this point we will leave the matter. I have not brought before you to-night these theories for the purpose of trying to destroy them; nor do I wish to champion them. Rather have I been persuaded to bring them forward as I am of the opinion that they are not so well known to entomologists, having been based chiefly upon the science of Botany, as they ought to be. Whether they are right or wrong is, and will be no doubt for some time to come, a very debatable point. But this much I think can be claimed for them, that they may tend to revive interest in the study of the distribution of insects, a study which has sadly fallen off of late years. As I remarked before it is unfortunate for Entomologists that they have not the evidence available for use, either to support or disprove the theory to the extent that it is available to the Botanists. Perhaps it is not too much to hope that before long it will be greatly increased.

In conclusion, I thank you all sincerely for the very kind way in which you have listened to me to-night. I take this opportunity of thanking the Officers and Council of the Society heartily for the generous help which at all times they have given me; with them always at one's elbow the task of filling this Chair loses half its terrors. And I wish also to express my high appreciation of the honour you do me in electing me your President for a second year.

ABSTRACT OF PROCEEDINGS.

FEBRUARY 8th, 1923.

Mr. E. G. Bunnett, M.A., F.E.S., Vice-President, in the Chair.

Mr. R. W. Fawthorpe, of 2, Western Road, Wandsworth, S.W., was elected a member.

Mr. Frohawk exhibited a beautiful coloured drawing of *Pyrameis cardui* in a setting of vegetation. The delicate surface colour was admirably portrayed; also a drawing of a flying-fish, by an officer of the "Brilliant," who was struck in the face by the fish while standing on the deck, 18 to 20 feet above the sea.

Mr. A. E. Tonge exhibited a short series of *Colias croceus* (*edusa*), bred in November last, in artificial heat, from ova laid by a ♀ taken at Dorking, early in September; 16 were ♀ s, 18 were ♂ s. One ♂ has a somewhat pale ground colour, but there was no variation noticeable beyond this. They were well up to the average in size. One ♀ is teratological, the left hindwing being smaller than the right; one ♀ has symmetrically misshapen costae; and one ♂ a similarly distorted hind margin, due to pressure (external) on the pupa, which failed to spin up properly, and was pinned up with a paper strip.

Mr. Hy. J. Turner exhibited a dark ochreous coloured male of *Gonepteryx rhamni*, found among a very large number of normal examples, all taken in the British Isles, but with no data.

Mr. A. W. Buckstone exhibited series of normal—(A) *Epirrita* (*Oporabia*) *autumnaria* and *E.* (*O.*) *filigrammaria*, with (B) a series of hybrid *autumnaria* ♂ × *filigrammaria* ♀; (C) the resulting series of two pairings of (B); and (D) the progeny of two pairings of (C). He also showed drawings of the genitalia of ♂ and ♀ of the two typical species. The hybrids were mostly intermediate between the two species, in regard to shape of wings, size, and markings. The first cross-pairing of the hybrids gave specimens mostly resembling *autumnaria* rather than *filigrammaria*. The series (D) might easily pass for *autumnaria,* except four specimens which have the wings narrow as in *filigrammaria.* It may be that this is due to each generation being fed on birch and hawthorn, the food of *autumnaria*; that of *filigrammaria* being heather or bilberry. The larvae of the first and second generations, generally speaking, resembled those of *filigrammaria*; whilst those of the third were mostly like *autumnaria.* These results appear to confirm the opinion of most authors, that *filigrammaria* is but a small form of *autumnaria.*

Mr. A. W. Mera exhibited series of *E.* (*O.*) *christyi,* from Chalfont Road, and of the melanic race of *E.* (*O.*) *autumnaria,* from Middlesborough; and remarked how extremely closely allied they appeared to be. He had bred series similar to those of Mr. Buckstone, and his results were much the same.

Captain Crocker exhibited a long series of *Coenonympha pamphilus* illustrating the more or less normal variation exhibited by the species. Ground colour from dark, almost dusky, to very light; with only the trace of an apical spot; others with a large ocellated one; some with extremely developed marginal dark band; considerably suffused from the dark margin; others with an additional spot on the fore-wing; great variation in size; etc.

Mr. K. G. Blair exhibited the two forms of *Anaitis plagiata* which Dr. Jordan had demonstrated were quite distinct species. It was considered desirable to compare the larvae of the two forms.

Mr. H. W. Andrews exhibited the flower-heads of an Umbellifer covered with numerous dead Anthomyiid flies (*Hylemia* sp.). Doubtless a case of resorting to the plant to die in peace, as the flowers have no mechanism by which the flies could be detained.

Mr. Stanley A. Blenkarn exhibited the following Coleoptera:—*Staphylinus* (*Ocypus*) *pedator*, Box Hill, August 1922; *Lycoperdina succincta,* taken by Messrs. Bedwell and Stott, at Mildenhall, Suffolk, October, 1922; *Anchomenus* (*Agonum*) *4-punctatum,* Crowthorne, April 21st, 1919; *Sphodrus leucophthalmus,* in a corn-shop, Church Street, Woolwich, July 7th, 1908; *Leistus montanus,* Cotacol Curan, September 9th, 1922; *Trechus lapidosus,* September 21st, same place; *Acidota* (*Phyllodrepoidea*) *crenata,* Lanarkshire, September and October, 1919-21; *Prionocyphon serricornis,* Crowthorne, September 3rd, 1922; *Rhagonycha unicolor* (*translucida*), Box Hill, June 20th, 1922; and *Stenus solutus,* Slaugham, Horsham, June 10th, 1922.

The Rev. J. Waterston read a paper, with lantern illustrations, entitled "The Natural History of St. Kilda." (See p. 1.)

FEBRUARY 22nd, 1923.

Mr N. D. Riley, F.Z.S., F.E.S., President, in the Chair.

Mr. L. W. Newman exhibited a series of fine aberrations of *Charaeas graminis*, including the extremes, very heavily marked and almost devoid of markings, with others of varied ground colour; a fine heavily marked specimen of *Noctua depuncta* var. *maddisoni*; a specimen of *Dianthoecia carpophaga*, very red in ground colour with heavy black markings; two ♀ *Noctua subrosea*; a *Chrysophanus dispar* ♂; and a painting of a very much suffused aberration of *Argynnis cydippe* (*adippe*); all the last from the "Horne" collection recently dispersed at Stevens' sale rooms.

Mr. T. H. L. Grosvenor exhibited some *Zygaena stoechadis*, which were undoubtedly of the facies of *Z. filipendulae*.

Mr. A. A. W. Buckstone exhibited his series of *Anaitis plagiata*, and pointed out those specimens which, according to the showing of Dr. Jordan, were another species (*efformata* (?)).

Mr. Blenkarn exhibited the uncommon and local beetle, *Lebia chlorocephala*, from Otford, Kent.

The rest of the exhibits were series of lantern slides.

Mr. Hugh Main exhibited many slides of his observations at Avignon and other places in S. France, on the early stages, habits, and habitats of *Leptis vermilio*, a Dipteron; of the ant-lion, *Myrmeleon* sp.; of *Palpares* sp.; and the spider, *Lycosa narbonensis*, etc.

Mr. Frisby showed slides of the Herring Gull, the milk vetch, the orchid *Spiranthes autumnalis*, the great sage *Salvia pratensis*, etc.

Mr. Dennis showed a long set of British grasses, including many uncommon species.

Mr. Bunnett exhibited slides of views of scenes and observations made during his stay in N.W. Canada, and illustrating his annual address.

Mr. Dods showed a series of slides of plants made by colour photography.

MARCH 8th, 1923.

A box of Lepidoptera was added to the Society's Collection by Mr. A. A. W. Buckstone.

Mr. E. J. Hare exhibited a probably unique aberration of *Anaitis plagiata*, a dark form with a very well-defined median band filling the space between the two median transverse lines, and a brown basal patch; taken at Erith, September 1st, 1920. Also a form of *Leptosia sinapis* with all the normally black markings of a dull yellowish-brown; the body and antennae were brown. Taken at Symon's Yat, on June 5th, 1922. It was considered to be of a 2nd brood.

Mr. O. R. Goodman exhibited a short series of *Thymelicus acteon* from the Isle of Purbeck, and pointed out that the ♂s were distinguished by a crescentic line of orange dots in the angle of the forewing. For comparison he exhibited ♂ specimens from the South of France showing both the stigma and the crescentic line of dots. The President said that probably the British form should be considered as a local race.

Mr. F. W. Frohawk exhibited ten specimens of British *Aporia crataegi*, five of which had supernumerary veins in the hindwings running from the margins, in three forming a terminal branch to the lower radial, and two with short rudimentary marginal veins between the upper and lower radials. Two females had on the upperside pronounced black markings at the end of the discoidal cell in the hindwings; a male had a pale ochreous yellow underside with hindwings heavily dusted with black scales; and two males had the hindmargins emphasised with, in one heavy and in the other slight marking.

Captain Crocker exhibited a very curious aberration of *Polyommatus icarus*, taken some years ago, and sent to him by Mr. Dale of Southampton. The usual colour and markings were almost obliterated in the general somewhat light brown suffusion.

Mr. Robert Adkin exhibited the following artificially produced aberrations of Palaearctic Rhopalocera:—

Pyrameis atalanta.—Red band and white spots on forewings altered in shape; red band on forewings almost obliterated. Forewings with a subdiaphanous appearance.

Vanessa io.—With black border to hindwings. With ocelli of both fore- and hindwings obliterated. Colour of whole insect changed to dull lavender-brown, but with ocelli normal.

Aglais urticae.—Costal blotches partially united and discal spots much reduced on forewings; hindwings unicolorous blackish-brown. Costal blotches united and discal spots absent on forewings; hindwings dark coppery-brown. Forewings similarly affected; hindwings normal.

Eugonia polychloros.—Costal blotches of forewings smeared, and blotches of hindwings increased in size.

Apatura iris.—White bands partially obliterated on all wings.

Melanargia galathea.—Black markings much increased.

Dryas paphia.—Silver markings of underside absent. Probably the result of moisture treatment.

Argynnis aglaia.—Ground colour paler than normal.

Polyommatus (*Agriades*) *thetis* (*bellargus*).—Distinct black spots on margins of hindwings.

P. (*A.*) *coridon.*—Black borders of wings inclined to encroach on the discal area.

Coenonympha pamphilus.—Black borders of all wings intensified.

He said that many years ago Merrifield, Standfuss, and others, had found by experiment that the colours and markings of some species of Lepidoptera might be altered by treatment of the pupa at a critical stage with abnormal heat, cold, moisture, etc. Some of the Continental collectors had been at work on these lines, and appeared to have reduced the experimental work of some forty years ago to a fine art. He was not aware that they knew just what forms their treatment would produce, nor what proportion of the pupae put into cold storage, and so forth, would survive the treatment, but certain it was that large numbers of these aberrations, the majority of them very like those occasionally found in a state of nature, were being produced.

Mr. H. Moore contributed the following notes and exhibited the specimens referred to.—

Anosia erippus, Linn.—A specimen taken at sea, 100 miles off the coast of South America. It differed from N. American examples in the marginal row of spots being fulvous instead of white, and with extra spots on the forewings, similar to one received from Buenos Ayres.

Œceticus omnivorus (Psychidae).—A number of cases from Matiere, North Island, New Zealand, the largest being $3\frac{3}{4}$ inches long. Several contained the shells of the degenerate females, from which hundreds of larvae had emerged during transit, leaving the interior of the shell filled with a fluffy mass of egg-shells and silk. The larva feeds at night, chiefly on the manuka-tree (*Leptospermum*), and one would imagine it to be well protected against parasites. Many, however, are attacked by the Dipteron, *Eurigaster marginatus.* Generally only one or two of its pupae are found in a case —Hudson says eleven, and even more sometimes. One of the cases exhibited contained over twenty. A hymenopterous hyper-parasite (*Pteromalus*) sometimes infests the *Eurigaster*, but how, or where it attacks it, is unknown. *E. marginatus* is also parasitic on the larvae of several Noctuid moths, so one may safely conclude that the parasite is nocturnal also.

Hemideina megacephala, Butl., ♀.—This large forest-cricket is the "Weta" of the New Zealander, and is said to be the only insect the "bush-feller" fears. Its bite is generally believed (probably in error) to be poisonous; but without doubt it is severe, the male having formidable jaws. It is found chiefly in the "mahoe" tree (*Melicytus ramiflorus*). It is uncertain whether it starts its own burrow, or makes use of those of other wood-boring insects. The captor's experiences make interesting reading; it was only after chopping into over twenty trees that he found a live full grown one. His care that it should not get too near him, is amusing, and at the same time evidence of the dread in which it is held. (Extracts from the correspondence were read to the meeting.)

Dr. Fremlin read a paper entitled "The Growing Importance of Entomology," and a short discussion took place. (See *Ent. Record*, Vol. XXXV., p. 136.)

MARCH 22nd, 1923,

Mr. Walter Burch, of 35, Ansdell Road, Peckham, was elected a member.

Mr. A. A. W. Buckston exhibited a male of *Pieris brassicae* with a small black spot on the disc of the forewing, taken at Eltham, Kent, in May, 1893. It was named ab. *nigronotata* by Jach.; specimens of *Anticlea nigrofasciaria*, from Malvern, bred, one having the transverse lines much emphasised in breadth, and with a dark ground colour, the other an unusually light coloured specimen; and a *Melitaea aurinia*, from near Brighton, having the usual outer light marginal spots almost obliterated, making a broad black margin, which was intensified by the first dark line being removed somewhat towards the margin, causing the inner light blotches of the forewings to be elongated, particularly towards the costa, where there was a conspicuous light costal blotch.

Col. R. H. Rattray read a paper on the "Indian Cuckoos." (See page 12.)

APRIL 12th, 1923.

Mr. P. H. Windsor, "Fern Hill," Horley, was elected a member.

There were no exhibits.

Mr. E. H. Ellis read a paper on the "Life-History and Structure of Mosses," illustrated with lantern slides, many of them made by Mr. Dennis. (See page 23.)

APRIL 26th, 1923.

Messrs. W. G. Nash, Clavering House, Bedford, and W. S. Brocklehurst, Grove House, Bedford, were elected members.

Mr. K. G. Blair exhibited the stick-insects *Bacillus rossii*, living adult ♀ ; *B. gallicus*, dead adult ♂ and living young in 1st instar; and *Carausius* (*Dixippus*) *morosus* ♀ for comparison. He pointed out the distinctive characters of the three species. The *B. gallicus* were from ova laid in 1921. Some of these hatched and fed up in 1922, and are now all dead; others laid over as eggs until March last, but further ova remain still unhatched. He communicated the following note:—

"From time to time in recent years, notes biological and otherwise, have been published, which purport to relate to '*Bacillus rossii*'; but in nearly all cases the identification has been at fault, the subject of the notes being *Carausius* (*Dixippus*) *morosus*.

"The two genera are readily separated by the length of the antennae; in *Bacillus* these are but little longer than the head, whereas in *Carausius* they reach to the tips of the extended front legs. The two species of *Bacillus* may also be separated by the antennae, these being longer and with more numerous joints in *B. rossii* than in *B. gallicus*, reaching in the former to the middle of the femora of the extended forelegs, whereas in *B. gallicus* they are obviously shorter."

Mr. L. W. Newman exhibitad a short bred series of *Melitaea cinxia*, extreme forms of aberration: two undersides with black bands; two undersides with a paucity of markings across the central area, and two uppersides with almost complete absence of markings on the outer two-thirds of the wings, a very unusual form of aberration in this species.

Mr. Moore exhibited a few Coleoptera from King's County, North Island, New Zealand, and drew attention to the Longicorn, *Prionoplus reticularis*, the huge white larvae of which lives in the

Kauri-pine, the "kuku" of the Maoris, and esteemed by them as a great delicacy. The eating of beetles and larvae by the natives of other lands was mentioned; also an amusing incident in the experience of a collector in British North Borneo.

The President read a letter from Vienna giving an account of the experiments of grafting in insects. Further and more definite information was required yet.

MAY 10th, 1923.

Capt. Kenneth J. Hayward, of Chiswick, was elected a member.

Mr. A. E. Stafford exhibited a living ♀ *Gonepteryx rhamni*, taken in Surrey on May 4th, after being observed to lay two eggs on twigs of Buckthorn (*Rhamnus*). Twenty-two further eggs were laid in captivity.

Mr. A. E. Tonge exhibited ova of *Eucosmia certata*, which had been laid on barberry in his own and neighbouring gardens at Reigate, where the species was not uncommon.

Mr. A. W. Dennis exhibited the flowers of the bogbean, *Menyanthes trifoliata*, from a Chelsea garden.

Mr. H. J. Prior, F.E.S., gave a lecture, "The Life of the Bees," with a series of lantern slides in illustration. A discussion followed.

The following is a synopsis of the lecture:—

Of the world's 2000 distinct species of bees, over 200 of which are indigenous to the British Isles, the lecturer first dealt with the Sand bees (*Andrena*) and the Leaf-cutter bee (*Megachile*), both of solitary habits. Secondly, with Humble bees (*Bombus*), of semi-social habits. Thirdly, with the Social Honey bees of the hive (*Apis mellifica*), cultivated for its usefulness in honey production and pollination of blossoms.

The metamorphosis of the bee, from the egg to the emergence from the cell, was illustrated by a series of unique views.

Acarapis (*Tarsonemus*) *woodi*, a parasite of the bees, was also illustrated by a series of microphotographic slides.

Entomology has so often been applied with beneficial results to mankind, and in this instance the lecturer further demonstrated the applicability of the science to practical apiculture, the production of honey and fruit as food.

Fifty slides in all were shown.

MAY 24th, 1923.

Mr. K. G. Blair, B.Sc., F.E.S., Vice-President, in the Chair.

Messrs. G. A. W. Stolzle and R. W. Stolzle, of Forest Hill; J. F. Johnstone and C. H. Cork, of Rayleigh, Essex; and F. A. Parker, of Cricklewood, were elected members.

Mr. F. A. Parker showed a female specimen of *Euchloë cardamines* with streaks of orange male coloration on the forewings.

Mr. Enefer exhibited the larvae and imagines of the beetle, *Phyllobius argentulus*, feeding on biscuits; an example of *Hadena pisi*, bred from a larva found at Mürren, Switzerland; and a sample of peas and lentils from Egypt infested with *Bruchus pisi* (Col.).

Mr. Mera exhibited a short series of *Venilia macularia*, which had emerged after being two years in pupa.

Mr. K. G. Blair exhibited empty galls of the Cecidomyiid, *Mycocecis ovalis*, Edw., on a bark-encrusting fungus, *Hypochnus* (? *fuscus*).

Mr. R. Adkin read a paper: "Some Ancient Naturalists and their Work." (See page 28.)

MAY 26th, 1923.

Field Meeting at Ranmore Common.

Leader, Mr. Hy. J. Turner, F.E.S.

The weather was fine, although in places the wind was keen. Advantage had been taken of the railway facilities for obtaining cheaper fares with the option of returning from a station which was not that of arrival. A good number of members and their friends assembled at Bookham station, and walked thence through the village to the lane and footpaths skirting the eastern side of Polesden Lacey, until the northern slope of Ranmore Common, with its thick woods, was reached. Here the party dispersed more or less, some working the common woods, others going into the private woods on the southern slopes of the chalk range; some even penetrating to the well-famed Piggott's Hole. The company reassembled at the end of the afternoon for tea, near the church, and subsequently they found their way by valleys, woods, and lanes to the Brighton Railway at Burford Bridge, Boxhill. Thence a short journey took them to Ashtead, where they were able to rejoin the

South-Western train back to Waterloo. No reports of captures or observations have reached me, but I know that the usual plants, insects, birds, etc., previously noted as being in the locality at this date, were met with.

In one place there was a fine display of teasel (*Dipsacus sylvestris*), with their basins intact and filled with water; whilst near by the figwort (*Scrophularia nodosa*) was swarming with the viscid larvae of a species of *Cionus* (Col.). Butterflies seen were *E. cardamines*, *B. euphrosyne*, *C. rubi*, *H. lucina*, *H. malvae*, *N. tages*, and *C. pamphilus*.

JUNE 9th, 1923.

Field Meeting at Westerham.

Leader, Mr. F. B. Carr.

This meeting was attended by only four members on account of the violent rain, which lasted the whole day.

JUNE 14th, 1923.

Mr. E. J. Bunnett, M.A., F.E.S., Vice-President, in the Chair.

Mr. Brown, on behalf of Miss Cheesman, exhibited specimens of *Pyrophorus* (*Elateridae*) from Trinidad; and mentioned that the light was caused by fat-bodies and digestive fluid mixing with oxygen and causing combustion; and that the light produced was concentrated by a reflector believed to be composed of uric acid crystals. This light was an adjunct to pairing, and was also supposed to be used as a means of defence. Tiny electric lamps had been made similar to the light of *Pyrophorus*; and the males had been attracted in response to flashes imitative of the beetle's use of the light.

Mr. Leeds exhibited a tail portion of a larva of *Strymon pruni*, the remainder of which had been eaten, when the larva was preparing to pupate, by another larva of the same species. The pupa of the culprit was shown. In the discussion which ensued it was remarked that there was a tendency to cannibal habits in the *Lycaenidae*.

Mr. Enefer exhibited an abnormal cabbage leaf, from the mid-rib of which a curious stalked leaflet was growing.

Mr. Bunnett exhibited *Cryptocephalus parvulus* (Col.), from Oxshott.

JUNE 28th, 1923.

Mr. E. J. Bunnett, M.A., F.E.S., Vice-President, in the Chair.

Mr. S. N. A. Jacobs, 5, Exbury Road, Catford Hill, S.E. 6, was elected a member.

Mr. H. Main exhibited the cocoons of *Heterogynis penella*, a species of Lepidoptera allied to the *Psychidae*; the female is wingless, and a recently emerged living specimen was shown, which went in and out of its chrysalis case. Reference was made to the account of this species given by Dr. Chapman in the "Trans. Ent. Soc. Lond., 1902. They came from St. Martin Vésubie. He also showed specimens of *Ascalaphus ottomanus*, recently recognised as occurring in S. France, and a Neuropterid larva from Agay, somewhat comparable to the *Pterocroce* larva from Egypt, which was also exhibited.

Mr. T. H. L. Grosvenor exhibited numerous species of Eastern Argynnids to illustrate Mr. Goodman's notes on the genus *Argynnis*.

Mr. Blenkarn exhibited the beetle *Cryptocephalus nitidulus* from Mickleham.

Mr. Parker exhibited an aberrant *Mimas tiliae* bred from ova laid by a captured female. There was no green coloration, all the colour being of curious shades of deep rich red-purple. The remainder of the brood were normal in colour.

Mr. Cheeseman exhibited two specimens of *Argynnis aglaia* from Farningham, Kent. The ♂ had a considerable amount of dark brown suffusion in the usual green markings öf the underside, and the ♀ had an excess of very deep black area on the upperside.

Mr. Bunnett exhibited, on behalf of Mr. Pizey, a collection of butterflies and moths, and of some other orders, illustrative of the Fauna of Ceylon. He also showed some chocolates received from a friend on April 9th, from which he had bred a specimen of *Ephestia ficulella* (exhibited) on May 12th.

Mr. Hy. J. Turner exhibited the following Argynnids to illustrate the notes of Mr. Goodman (see below).

I. *Argynnis aglaia*, race *apenninicola* (Italy), race *kenteana* (Mongolia), race *alaica* (Fergana), race *fortuna* (Asia Minor), race *ottomana* (Chitral), races from the Suvretta Thal, Engadine and from Moncayo, Spain, for comparison.

II. *Argynnis cydippe* (*adippe*), race *clarens* (Italy), race *jaindeva* (Himalaya), race *coreodippe* (Corea), race *tianschanica* (N. China), race *vorax* (Pekin), race *pallescens* (Japan), race *rückerti* (Shantung), form *cleodoxa* (Pré St. Didier), form *cleodippe* (La Granja), form *chlorodippe* (Albarracin), race from Gavarnie, Pyrenees.

III. *Argynnis niobe*, race *appeninica* (Italy), race *ornatissima* (Kansu, Siberia), race *philistra* (Fusio), form *eris* (Alps), race *orientalis* (Fergana), race *tekkensis* (Turkistan).

IV. *Dryas paphia*, race *thalassata* (Siberia), race *anargyra* (Spain).

Other closely allied species shown were *A. kamala* (Chitral), *A. nerippe* (Yokohama), *A. niphe* (Nanking), *A. childreni* (Sikkim), etc.

Mr. Goodman exhibited a large number of Argynnids in illustration of his "Introductory Notes to a Discussion of the Three Larger British Argynnids."

"The insects we are considering, have, perhaps, been the means of stimulating our early enthusiasm for our beloved pursuit. How many of us can recall the excitement engendered by the first sight of the brilliant *paphia* flashing through our woodlands, without remembering the time when this was a much sought rarity.

"The three larger species occurring in the British Isles—*Argynnis aglaia*, *A. cydippe* (*adippe*), and *Dryas paphia*—are representative of the very large and extensively distributed family *Argynnidae*, which occurs throughout the whole of the Palaearctic and Nearctic regions, from Japan in the east to Western America, and from the Arctic Regions at a latitude of 81° 50 to the northern limits of the Sahara desert in the south. Of the twenty-two European species six are represented in the British list, and only one is peculiar to Europe, namely, *A. elisa*, which is confined to the islands Corsica and Sardinia.

"The three species under discussion are commonly distributed throughout Europe, and extend even to Japan. It will be understood where the range is so extended, that the various species must naturally develop local races, so that the eastern forms differ very considerably from those of the west, and have been described and named as separate species. Even within the confines of these islands there is considerable local variation, both in markings and habits.

"In the January number of the *Entomologist* of last year (1922), Mr. H. W. Pugsley drew attention to the fact, that the examples of *Dryas paphia* in the hilly districts of Devonshire occur at least five weeks later than those in the New Forest and other more eastern districts, where it emerges at approximately the same time as *A.*

aglaia and *A. cydippe*; and he suggests that this form constitutes a separate race, more especially as from examination of examples from other British and continental localities, he finds differences in the size and shape of the wings. I am hoping that some member is exhibiting examples from Devon or Cornwall to-night, so that these differences can be noted.

"In the case of *Argynnis aglaia*, Mr. H. T. G. Watkins has noted in the May number of the *Entomologist* of this year (page 108), that ♂ and ♀ examples, taken by Mr. W. G. Sheldon in West Sutherland, differ from the Scandinavian *A. aglaia* in their larger size and heavier black markings, the darker green of the underside, and the prominence of the silver spots. He has named this subspecies *Argynnis aglaia* race *scotica*. This note induced me to examine all my English *A. aglaia*—I have no Scottish examples—and compare them with continental forms; and I am inclined to think that the differences noted in race *scotica*, also apply to all the English race, in which case the name *scotica* is rather an unfortunate choice.

"I am exhibiting both British and Continental examples, and I should be glad of members' opinions. Perhaps the most interesting feature of these insects is their tendency to variation and aberration, which seem to follow two, or perhaps three, distinct lines:—

1. The tendency to develop melanism in the ♂s in the enlargement of the heavy dark markings of the upper surface of the wings, especially in the basal areas; and in the ♀s, when the whole of the fulvous markings are replaced by steely grey in varying degrees, exampled by the var. of the ♀ of *A. paphia* (*valesina*), which occurs in most southern localities with the typical female in varying percentages, ranging from one or two per cent. to as much as eight or nine per cent.

   "Mr. South, in a paper on this genus read before this Society on February 13th, 1896, suggests that these dark forms are perhaps throw-backs to an ancestral type, more especially as the constant form of the *paphia* of Japan (*paphioides*, Butler), is intermediate between the western typical female and var. *valesina*, although the ♂s do not differ materially. This view has also been expressed by Dr. A. G. Butler in the "Entomologist" of March, 1923; but I have reason to believe that the views of our learned President do not coincide.

   "This opens out a valuable field of investigation, especially as it has been noted that climatic conditions seem to affect the proportion of this form of melanism as instanced by the great percentage of *valesina* found after cold or wet seasons. It has also been established that if either pupae or larvae are exposed to extremes of cold at certain periods of their metamorphosis the result is an increase in dark pigmentation.

2. "The second tendency is one that is not by any means confined to this genus, examples being frequent in the *Satyridae*. I refer to the pale patches occasionally met with on both upper and lower wings; these patches are usually symmetrical, but not invariably so. It has been held that as these pale patches usually occur towards the apex of the upper wings, in the same position as the lighter areas of the forewings of var. *valesina*, this also is due to reversion to an ancestral form. Microscopically examined the scales on these patches will be found to be imperfectly pigmented, whereas in *valesina* they are, of course, fully pigmented. This, to my mind, suggests some constitutional weakness, attributable not to heredity but to external influences, the result being a failure in pigmentation, or albinism.

3. "The third tendency is, perhaps, due to opposite causes, and results in the silvery areas (which are pigmentally white) on the undersides of the hindwings being obsolete or obsolescent, with a resultant increase in brown ground-colour, due to the stronger pigmentation.

"In the British Isles this form is confined to *Argynnis cydippe*, exemplified by the aberration *cleodoxa*, but in Southern Europe this form occurs in greater proportion, and indeed replaces the type in some localities. The nearly allied species, *A. niobe*, is much more subject to this kind of variation, and in some alpine districts the typical form with silver spots is entirely absent. I do not think that *A. aglaia* is ever subject to this variation, although I exhibit a specimen from Gavarnie without silver or green on the underside, which seems to me to be *aglaia*. The parallel form of *Dryas paphia* sometimes occurs on the Continent, and is called var. *anargyra*. There is also a very handsome variety of *A. cydippe*, in which the orange ground of the underside hindwings is heavily scaled with green and red. This form is var. *chlorodippe*, and it occurs as a local race in the Spanish Peninsula. I exhibit two or three specimens.

"At the last annual meeting the Rev. G. Wheeler said that extreme examples of this variety, *chlorodippe*, were reported from Westmorland, and this, if established, will constitute the only record for its northern occurrence. Perhaps, examples exhibited to-night may prove to be this form.

"I exhibit forms of the three species under discussion from the British Isles and the Continent, together with allied species, which will illustrate the variations referred to in the foregoing notes."

There was a short discussion.

JUNE 30th, 1923.

Field Meeting—Caterham.

Leaders, Messrs. F. B. Carr and Hy. J. Turner.

This was a new locality to the Society. The route was through the lanes to the crest of the Downs, west of the main Godstone road. The thick woodlands covering the higher portion of the hill and the southern face were thoroughly explored by the party, numbering nearly twenty. The absence of captures was characteristic of the season, but the varied and luxuriant vegetation, and the general aspect of the locality, gave much promise in a more favourable year. Tea was obtained at the fort cottage, and photographs of the party were taken.

JULY 12th, 1923.

Mr. Main exhibited the female *Emus hirtus* (Col.), which Mr. Goodman had sent to Mr. Withycombe in July, 1922, and which he (Mr. Main) had kept, and hibernated in one of his terrariums. Recently he had obtained a male of the species in S. France, and as a result of the pairing obtained ova had been laid and grubs had successfully hatched. Some of these he exhibited. The larvae fed readily on flies, maggots, and caterpillars.

He also showed the young larvae of the *Heterogynis penella* female, exhibited at the last meeting. These fed readily on laburnum.

Mr. Hodgson exhibited series of *Polyommatus* (*Agriades*) *thetis* female, taken in the Cotwolds, which showed considerable variation in the amount of blue coloration; and similar variation in a series of *Polyommatus icarus* from both the Cotswolds and the Surrey Downs.

Mr. Littlewood exhibited specimens of *Macrothylacia rubi*, bred by forcing in November and December without any period of exposure to cold intervening. The larvae and pupae were subjected to a continuance of moist-heat.

Mr. Grosvenor remarked that a locality, whence he had hitherto obtained only typical *Zygaena filipendulae*, this year produced only a *hippocrepidis*-like form.

Mr. Hy. J. Turner exhibited (1) two living specimens of *Oidaematophorus lithodactylus*, bred from larvae found on *Inula dysenterica* at Lyme Regis; a pupa case of the same; and a series of imagines from the late C. G. Barrett's collection, with continental examples. He stated that the larvae were hairy, like the *Inula* leaves, of the colour of the food plant, with a broad faint purple band along the back. He also pointed out that the living examples were very variegated in marking, and that there was considerable latitude in the general coloration of the species from different localities.

(2) Several short stems of *Viburnum* from which he had bred examples of *Aegeria andrenaeformis*, and pointed out the curious caps still attached at the exit of the larval burrows, with the pupa-cases projecting under these caps.

(3) A very long series of the beautiful continental Lycaenid, *Polyommatus dolus*, and communicated the following note:—

"*Polyommatus dolus* belongs to a group of 'blues' most of the species of which are marked by a long white or bright-coloured 'vitta' on the underside of the hindwings. The males are of a delicate silky-blue, suggestive of extremely bright *coridon*, while the females are of a deep brown with a darker veining, but always without trace of the blue of the male. The undersides are of a paler, or whitish-brown with a few eye-spots in a submarginal row, usually more strongly expressed (in the ♀) on the forewings. The specimens from the 'deserts of Central France' show a whitish mesial streak on the hindwings below, being called race *vittata* by Oberthür; those from Central Italy are without this mesial vitta, the males have the basal areas of all the wings of a dirty brown colour, and are named race *virgilia* by Oberthür; the females of this form are more strongly veined. In Asia Minor another form occurs, called race *menalcas*, Frr., with a paler underside and smaller ocelli below, and a much paler white-blue coloured male." Examples of the closely allied species *P. damon* and *P. admetus* were also shown for comparison, the females being almost indistinguishable; and in the latter species the male is not blue, but very closely resembles the female. The various forms have been well figured by Hübner, Herrich-Schäffer, and Oberthür. The second of these authors figures a form with a very strongly expressed vitta, under the name *epidolus*."

JULY 14th, 1923.

FIELD MEETING AT CANVEY ISLAND.

Leader, Mr. HY. J. TURNER, F.E.S.

This meeting was arranged in order that members might obtain the very local butterfly *Adopaea lineola*. The day turned out to be one of the hottest and most oppressive of the year, and only two members beside the leader attended. *A. lineola* was found in considerable numbers and in very good condition, but extremely local. *Melanargia galathea* was seen near Benfleet, and *A. linea*, with plenty of *Epinephele tithonus* along the hedgerows on the mainland. *Acidalia* (*Ania*) *emarginata* was obtained sparingly, and a few micros were stirred from the scanty brushwood on the sea-wall. A large clump of the uncommon *Helleborus viridis* was found growing along a disused brickfield road.

JULY 26th, 1923.

Mr. F. S. Windsor, of Horley, was elected a member.

Mr. A. W. Dennis exhibited a specimen of the small broom-rape, *Orobanche minor*, subspecies *amethystea*, a form which is parasitic on the roots of the sea-holly (*Eryngium maritimum*); whereas the typical form grows on the roots of species of clover. It had been grown from seed in the Chelsea Physic Garden. It is sometimes called *Orobanche eryngii*. A photo of *O. minor* (typical) was also shown.

Mr. E. Step exhibited the perfect skin cast by a young Smooth-snake (*Coronella austriaca*) he had captured at Studland, and pointed out that the skin of the eyes was also shed.

Mr. Edwards exhibited a flint with a very well marked fern-like device or "dendrite" of oxide of manganese upon it. It had been picked up on Salisbury Plain.

The President exhibited a most perfectly halved gynandromorph of *Polyommatus icarus*, right side ♂, left side ♀, taken at Martigny, Switzerland.

Mr. Jacobs exhibited a specimen of *Cemiostoma laburnella* (Lep.), to compare it with a specimen of the Homopteron *Psylla spartii* (?) found associated with it.

Dr. C. L. Withycombe exhibited a young ♂ of *Chirocephalus diaphanus*, bred from the egg. One ♀ and three ♂s were obtained from a cart rut, containing water, near Oxshott, on June 20th. Eggs were laid by the ♀ which then moulted and laid a fresh batch of eggs. Some eggs were at once taken and allowed to dry in damp clay. After one day's drying the clay was placed in water, and 18 hours after young *nauplii* hatched. The specimen exhibited was bred from this batch of *nauplii*. It was about a month old and nearly full grown.

Mr. H. J. Turner exhibited living examples of the case-bearer, *Coleophora troglodytella*, the larvae of which Dr. Robertson and he had found at Lyme Regis, Dorset, mining the leaves of *Inula dysenterica*.

Mr. Barnett exhibited ab. *schmidtii* of *Rumicia phlaeas*, ab. *obsoleta* of *Plebeius* (*Aricia*) *medon*, and an extreme form of the blue-scaled female of *Polyommatus icarus*; all were from Surrey.

Mr. Step gave an account of the habits of the Pyrenean newt, *Molge asper*, of which Mr. Goodman had sent him a pair in the summer of 1922. On June 14th, 1923, three ova were discovered, of which one hatched on July 8th, a second on the following day; but the third perished owing to an attack by a parasite (Qy *Achyla*). The larvae measured 13mm., and had the under parts white, whilst the upperside was mottled with greenish-grey.

AUGUST 9th, 1923.

Mr. Step exhibited a living female of *Prionus coriarius* (Col.) found running through the pine woods at Ockham Common, on August 3rd.

He reported subsequently that a single egg was deposited the day after the meeting. It was quite yellow and measured 4mm. × 1½mm.; but proved to be infertile.

He also showed a living large green lizard, *Lacerta viridis*, sent to him by Mr. Goodman from Bignasco, on the southern slopes of the Alps. It measured sixteen inches, of which 11½ inches were tail.

Mr. Hy. J. Turner exhibited a life-history of *Coleophora troglodytella*, of which the larvae were found by Dr. Robertson at Lyme Regis, Dorset; and a short series of *Emmelesia affinitata*, which occurred very sparingly at late dusk in the lanes near the same locality. He also showed a long bred series of *Eupithecia denotata* (*campanulata*), bred from the capsules of *Campanula trachelium*, the nettle-leaved bell-flower, gathered in 1922 at Ranmore.

Mr. Hugh Main showed some membranous eggs found by him under stones at St. Martin's Vésubie, S. France. He had recently opened one of them with a penknife and liberated a small lizard, to which the yolk-sac was still attached. This small lizard was also exhibited, having lived for nearly a week so far.

Mr. Stanley Blenkarn exhibited the extremely local coleopteron *Dryops anglicanus* taken in Wicken Fen, in May; also *D. auriculatus* from Mickleham, in early May, and *Balaninus betulae* from Hayes, Kent, in July.

AUGUST 11th, 1923.

Field Meeting—Prince's Risborough.

Leader, Mr. F. B. Carr.

This was a new locality to the Society, and was well explored by those who were present. The district is a charming spot with a hostelry in the centre, where the members obtained tea. No reports were sent in as to captures, and only odd specimens of various species were met with; this seems to be the universal experience of the present season.

AUGUST 23rd, 1923.

Mr. Robert Adkin exhibited a series of *Xanthorrhoë galiata* reared from ova laid by a moth taken at Eastbourne last autumn. The specimens showed a marked difference in the tone of colour of the central band ; in some of them this was of the usual dark shade, but in others it was of a pale blue-grey, a fairly frequent character of the species in that neighbourhood.

He also showed a series of *Coleophora lineolea*, with their cases, reared from larvae feeding on *Stachys lanata*, that was growing as a border to a flower-bed in an Eastbourne garden.

Mr. T. H. L. Grosvenor exhibited a unique and remarkable specimen of *Zygaena filipendulae*, taken by him this season at Royston, in which the right hindwing was an almost exact duplication of the right forewing in size, marking and colour. The neuration of this wing was that of the normal forewing. The wings of the left side were quite normal. It was peculiar that the frenulum was completely absent on both sides. The specimen was taken wild by himself, and seen alive by several entomologists on the ground at the time.

Mr. S. R. Ashby exhibited a specimen of *Hadena* (*Mamestra*) *dentina* (*nana*), taken by him at Oban, which was extremely melanic in general coloration. (See note below, p. 111.)

Dr. H. S. Fremlin exhibited a plant of *Datura stramonium*, a non-indigenous casual weed found growing on waste ground.

Mr. B. S. Williams exhibited the following species of Coleoptera: *Cassida sanguinolenta*, *Cephenninum thoracicum*, and *Euconnus denticornis* from Bedfordshire, *Byctiscus populi* from Herts, and *Euconnus hirticollis* from Wicken.

Mr. Enefer exhibited several items of interest brought by him from Switzerland, including musk beetle *Aromia moschata*, ♂ and ♀ of *Mutilla europaea*, the garden Spider *Epeira diadema*, the large *Epeira quadrata*, the great green grasshopper (*Locusta viridissima*), the nest and living imagines of the wasp, *Polistes gallica*, etc.

SEPTEMBER 13th, 1923.

Mr. H. Candler exhibited a collection of Rhopalocera captured in Natal during 1900-1-2, comprising three species of *Papilio*, seventeen species of *Pieridae*, five *Lycaenidae*, a number of *Satyridae*, and *Nymphalidae*, with eleven species of the genus *Acraea* and several of *Hesperiidae*. This collection he subsequently presented to the Society's collection.

Mr. A. E. Tonge exhibited (1) the parasitised larva of a Zygaenid, which he found at Lewes on September 9th. The larva was in a much later stage than the date would lead one to expect. It was probably a spring larva retarded in its growth owing to the presence of the parasite. (2) A specimen of the Dipteron *Echinomyia grossa*, bred from a larva of *Bombyx rubi* taken on Reigate Hill in October, 1922. (3) The predaceous Dipteron *Asilus crabroniformis* from Deal. (4) A strikingly marked abnormal specimen of *Cleora jubata* (*glabraria*), taken recently in the New Forest.

Mr. Blenkarn exhibited a pair of the longicorn coleopteron, *Leptura rubra*, taken by Messrs. Bedwell and Stott, at Horsford, near Norwich, in August, 1923. The species was new to this country. He also showed the local beetle, *Zabrus gibbus*, taken near Brighton in June of the present year.

Mr. O. R. Goodman exhibited a specimen of *Epinephele jurtina* var. *hispulla*, with an irregular pale area on the forewing, while in contrast the normal colouring was unusually bright; on the underside the colour was a very pale grey. He also showed a very large specimen of *Argynnis niobe* ab. *orientalis*. Both were from S. France.

Mr. T. H. L. Grosvenor exhibited a number of specimens of the Indian leaf-butterfly, *Kallima inachis*, which he had met with commonly in the plains of India. He pointed out that the range of variation in colour and pattern of the under surface was very considerable, the apparent fungoid growths being noticeable. When on the wing the bright orange of the upperside is very conspicuous, but when settled there is the greatest difficulty in seeing the exact position of an individual.

Mr. E. Step exhibited specimens of the Black Salamander (*Salamandra atra*), which Mr. Main had received from Switzerland. He pointed out the differences in the developmental history between this species and the Spotted Salamander (*S. maculosa*).

Mr. Enefer exhibited (1) a large species of *Cetonia* taken from thistle heads at Zermatt. (2) A large *Epeira* sp. (spider) from Visp. (3) The beautiful beetle *Trichius fasciatus* found on knapweed at Zermatt. (4) The Longicorn beetle *Saperda scalaris* taken on the trunk of a tree at Chamonix.

Mr. F. B. Carr exhibited a larva of *Stauropus fagi* beaten from birch at Oxshott, on September 1st, and now feeding on plum; *Asthena blomeri*, from Chalfont Road; and *Leptomeris imitaria*, bred from ova laid by a ♀ taken at Eynsford, Kent.

Mr. H. J. Turner read the following note on a melanic specimen of *Hadena dentina*, exhibited at the previous meeting by Mr. S. R. Ashby. "This melanic form of *H. dentina* was described and figured in the *Ann. Soc. Ent. Fr.*, 1837, p. 177, plt. 8, fig. 3, by M. Pierret, under the name *latenia*. The distinguishing characters of this form are stated to be large size, intensity of colour of the forewings, and the pronounced black markings. The specimen there described was taken in Switzerland. According to the late J. W. Tutt (*Brit. Noct.*) this form is considered very rare in this country, although some years ago a number were said to have been obtained in the Hebrides by the Messrs. Salvage."

Referring to the name of the species, Mr. Turner read the following note :—In 1766, Hüfnagel, in the *Berlinisches Magazin*, described a Noctuid species as " Anterior wings whitish-grey shading into dark grey, with a whitish grey dentate spot in the middle of the forewings. Of the third size. On tree trunks. Common," to which he gave the name *nana*. In 1776, Rottembnrg, in the *Naturfor.* suggested that this description referred to the species which has been known for many years as *Dianthoecia conspersa*, which he described at some length under the name *nana*. It is obvious that Hufnagel's description as given above cannot apply to *D. conspersa*, but does satisfactorily apply to *H. dentina*, and thus for the latter we must substitute the name *nana*, Hufnagel, by the law of priority. This does not interfere with the use of the name *nana* for the *Diantnoecia* known as *conspersa*, for the two species are not congeneric. The description of *Dianthoecia nana* by Rottemburg must stand as the original description of *conspersa*, which name must fall before *nana*, Rottemburg.

Mr. Turner also exhibited a number of species of the S. American family *Erycinidae*, of which our native *Hamearis lucina* is the only European example. The species shown illustrated the more prominent genera, and the general brilliant coloration of the whole family.

SEPTEMBER 27th, 1923.

EXHIBITION OF ORDERS OTHER THAN LEPIDOPTERA.

Mr. W. J. Lucas exhibited coloured drawings from life of—

1. *Spiranthes aestivalis*, Rich. (the summer lady's tresses), an orchid rapidly dying out in Britain. Perhaps the plants may now be almost counted on one's fingers.

2. Naiad and details of the dragon-fly, *Libellula quadrimaculata*, Linn.

3. Both sexes of the Great Bog Grasshopper, *Mecostethus grossus*, Linn., from the New Forest.

Mr. Priske exhibited very varied series of land shells he had collected during the present year, including *Helix aspersa* from Littlehampton, *Helix hortensis* from Littlehampton, *Helix arbustorum* from Corfe Castle, Dorset, *Helix lapicida* from Swanage, *Helicella barbara* from Saddlescombe, Sussex, and *Limnaea truncatula*, from Ponders End.

Mr. E. J. Bunnett exhibited (1) the Coleoptera *Ceuthorrhynchidius horridus* from Waterbeach, *Conopalpus testaceus* from Chipstead, and *Coccinella conglobata* from Waterbeach and Oxshott. (2) A new (?) species of *Panchlora* (Orthop.) and a *Gryllus*, probably new. Both were from Jamaica, and determined by Mr. B. Uvarov of the Brit. Mus. (3) Photographs of a new Mymarid, of which, apart from this specimen, only the type is known, recently determined as *Petiolaria anomala*, Blood and Kryger. (4) Ova of *Petrobia lapidum*.

Mr. H. W. Andrews exhibited his collection of British *Tabanidae* (*sens. lat.*), mostly collected in N. Kent. The species were very local.

Mr. B. Williams exhibited the following species of Coleoptera :—*Ceuthorrhynchus* (*Poophagus*) *nasturtii*, *Gymnetron rostellum*, *Hydnobius strigosus*, *Amphicyllis globus*, and *Dadobia immersa*, from the Harpenden district: *Orchestes pratensis*, *Chaetocnema confusa*, and *Liodes* (*Anisotoma*) *badia*, from South Beds; *Apion stolidum* and *Ilyobates nigricollis*, from Wickham; *Quedius brevicornis*, from Tring.

Mr. K. G. Blair exhibited a series of specimens taken by him this season and communicated the following note :—

" Some Insects of the Sandhills.—The insects exhibited were collected in June and July last, on the sandhills near Tenby, Pembrokeshire. The collection was not made with a view to the present occasion, or it could have been very much more extensive; but in casting around for a subject for exhibition to-night, some random notes on a few more or less interesting species casually observed, came to my mind as possibly suitable.

" One perhaps associates most readily the Hymenoptera and the Coleoptera with such a terrain, and in fact these two orders include nearly the whole of the species now shown.

" Hymenoptera.—*Megachile circumcincta*.—This interesting leaf-cutter bee was not uncommon, but only one nesting colony was discovered. This was in a slope of moderately hard sand with a quantity of loose dry sand on the surface, but with ridges of the harder sand showing through, with a scanty covering of grass and other vegetation. The holes were not very numerous and rather scattered. Females were observed carrying the characteristic bits of leaf, all being rose-leaf, which they must have brought from some little distance. Though *Rosa spinosissima* was fairly abundant on the sandhills, the pieces of leaf belonged to another species. A few ♂ s were also taken.

"*Coelioxys elongata.*—Two specimens of this inquiline were also captured, fortunately one of each sex, at the same colony of the *Megachile.*

"*Andrena albicrus.*—Was nesting freely, choosing bare slopes of the loosest sand. On one occasion, when a strong wind was blowing, the females were observed to alight without any hesitation and hastily burrow right into the sand. If they did not bury themselves at once they would be blown away, as frequently happened. As soon as a bee left its burrow the sand would at once fall down and obliterate it, but a shifting landscape, without obvious landmarks, appeared to present no difficulties to the *Andrena.*

"*Psammophila hirsuta.*—The season appeared to be too far advanced for this well-known fossor, for besides some dried fragments, only one specimen was observed. I had hoped to watch it with its caterpillar prey, but though I watched for some time, and on several days, for the return of this specimen to her nesting site, nothing further was seen of it. (The specimen exhibited is not from Tenby.)

"*Pompilus plumbeus.*—This little fossor was by far the commonest Hymenopteron present, running busily here and there over the surface of the hot sand, occasionally taking short flights, almost like jumps. The ♂ s are usually much smaller than the ♀ s, and almost ant-like in appearance. A few of the ♀ s were observed with their prey (spiders), for which probably the majority were searching.

"*P. spissus,* with its red and black abdomen, was much scarcer; only ♀ s were observed, none with prey.

"Diptera.—*Thereva* sp. ?—A silvery white insect was sometimes observed, several together, indulging in a mazy sort of dance a few feet above the ground. Of a sudden there would be none left; but after a few minutes they would be at it again. For some time I was unable to capture one, or to ascertain what the insect was: but eventually this *Thereva* was seen at rest on the surface of the sand, and to fly off and join the merry whirl. For some time only ♂ s were found, and it is probable that only this sex takes part in the dance; eventually one was seen flying, apparently paired with a much larger, darker fly, and I concluded that the ♀ must be very strongly different in appearance. An attempt was made to capture the pair, but only the ♂ was secured. When a ♀ was eventually identified, it was evident that my first conclusion was wrong, and the pair seen must have been a ♂ *Thereva* captured by an Asilid that was present at the same place.

"COLEOPTERA.—The most noteworthy beetle found was *Sitones grisea*, which also ran rapidly on the bare sand. So long as it remained stationary it was almost impossible to see it, but its rapid motions very quickly gave it away.

"*Otiorrhynchus atroapterus* and *Phylan gibbus* are only to be found by digging in the sand, as they remain buried.

"The feature that struck me most about these denizens of the sand dunes was their rapid motion over the surface of the hot sand —so hot sometimes as to be painful to the bare skin. Is it that they, too, find the heat painful, and only to be avoided by rapid motion? It can readily be understood that they would very quickly be dried up if they remained long stationary in such a roasting heat.

"Another point is the black colour affected by many of the sand-loving creatures. The *Sitones*, which lives on the surface, is scaly, and with a markedly cryptic coloration, but those that bury themselves in the sand, *e.g.*, *Aegialia sabularia*, *Opatrum sabulosum*, *Crypticus quisquilius*, and others, besides the two species exhibited, are frequently uniform black. Buxton has remarked on the prevalence of this colour among desert beetles."

Mr. Stanley A. Blenkarn exhibited the following species of Coleoptera:—*Calosoma inquisitor*, New Forest, August, 1922; *Leistus montanus*, Arran, 20.4.22; *Nebria complanata*, Devon, 1.7.13; *N. livida*, Saltburn and Bridlington, August, 1913; *Pelophila borealis*, Killarney, August, 1921; *Blethisa multipunctata*, 11.5.1921, Cam, Upware; *Panagaeus quadripustulatus*, Deal, 29.8.21; *Badister peltatus*, Darenth, Winchelsea, Killarney, Camber; *Licinus depressus*, Worthing, 21.10.22; *Sphodrus leucophthalmus*, Woolwich, 7.7.1908; *Agonum sexpunctatus*, Crowthorne; *A. 4-punctatum*, Crowthorne; *Masoreus wetterhalli*, Deal, 14.4.13; *Lebia cyanocephala*, Box Hill; *Agabus femoralis*, Horsell, 14.4.13, Wicken Fen, 21.5.23; *A. arcticus*, Arran, May, 1922; *A. undulatus*, Wicken and Askham, May, 1921; *Rhantus pulverosus*, Camber and Crowthorne; *R. notatus*, Gravesend, Stevenston, N.B.; *Hydaticus transversalis*, Wicken Fen, May, 1921; *H. seminiger*, Greenford, 28.4.1893; *Acilius sulcatus* var. *scoticus*, Arran, 1914; *Dytiscus dimidiatus*, Wicken Fen, May, 1921; *D. lapponicus*, Arran, 1914; *D. circumcinctus*, Wicken Fen, May, 1921; *Gyrinus bicolor*, Wicken Fen, 6.5.21; *G. urinator*, Rock, Cornwall, 5.5.22; *Quedius umbinus*, 1.10.21, Heyburn Wyke; *Staphylinus pedator*, 12.8.22, Box Hill; *Philonthus addendus*, 7.4.21, Mickleham; *P. atratus*, 21.5.21, Hendon; *P. lepidus*, 24.5.20, Deal; *P. nigriventris*, 6.20, Killarney; *P. fuscus*, 23.5.04, Gorton; 1.8.19, Beccles; *P. nigrita*, 7.22, Killarney; *P. micans*, 5.23, Mitcham and Purley: *P. fulvipes*, Llandaff; *P. keysianus*, 1912, Poole; *Neobisnius (Actobius) villosulus*, 5.1920, Luccombe and Mickleham.

Mr. S. R Ashby exhibited the very extensive and varied series of the Homopteron *Philaenus spumaria*, collected by the late Mr. W. West.

Mr. H. Moore exhibited the three species of mole-cricket *Gryllotalpa vulgaris* (*gryllotalpa*) from Europe, *G. orientalis* (*africana*) from Africa, Asia, Australia and New Zealand, and *G. borealis* (*hexadactyla*) from N. and S. America. He also showed a box of beetles from Nairobi, E. Africa.

Mr. Stafford exhibited a number of aberrations of *Agriades coridon*, taken at Royston this year, where the species has again been extremely abundant, and apparently more prone to aberration than in previous years.

Mr. Tonge exhibited a male specimen of *Agriades*, of a form generally considered a hybrid between *A. coridon* and *A. thetis*, to which the varietal name *polonus* had been given. It was a very fine example, and was taken at Reigate.

Mr. Hugh Main exhibited a number of items brought by him from the South of France and the Eastern Pyrenees.

1. Male and female of the two forms (green and brown) of the Praying Mantis, *Mantis religiosa*. The female often eats the male. It was very abundant at Vernet-les-Bains.

2. Two lizards which were found under stones.

3. An immature field cricket of which the colour was black. This will change later on to the brown colour of the mature insect.

4. A salamander, which he said was locally called a "beetle."

5. The earwig, *Chelidura dilatata*, a species with very curved forceps, and quite common in the Eastern Pyrenees.

6. An immature form of the *Empusa*. It will hibernate in this stage and become fully grown in the spring. The *Mantis*, on the other hand, is full grown in the autumn and does not hibernate as an imago.

7. An ant-lion (Myrmeleon).

8. Some Rhynchophorous beetles which were burrowing in the heads of thistles.

He stated that Frogs (*Rana agilis*) were very common; as also were the natterjack toad (*Bufo calamita*).

OCTOBER 11th, 1923.

The evening was set apart for a Special Exhibition and Discussion of *Coenonympha pamphilus*.

Mr. A. E. Tonge exhibited a series from Surrey, Kent and Sussex, including light and dark forms, also examples with apical spot obsolete, and with spot 4 on anterior wings developed on underside. One specimen has two black spots on the margin of the posterior wing on upperside; but the gem of the exhibit was a fine ♀ with a large apical spot on right forewing and totally blind on the left. He also showed, as a warning, three specimens killed with ammonia. This had entirely altered the colour of the wings to a pale muddy brown. In addition there were several specimens, of both sexes, with the apical spot bipupillate.

Miss A. K. Lock, on behalf of Mr. H. B. Williams, exhibited five examples of the striking form ab. *pallida*, Tutt, from Hertfordshire, 1914, ab. *bipupillata*, Wimbledon, and other specimens showing the undersides (1) with dark fascia, (2) with double apical spot, and (3) with obsolescent apical spot.

Mr. L. W. Newman exhibited various local races, many from N. and E. Kent, including a fine dark male, spotless forms, bleached examples, etc.

Captain K. J. Hayward exhibited a specimen with a row of submarginal spots on the hindwing above, taken at Padstow, N. Cornwall, in August, 1919. At Bruton, Somerset, in 1922, this form was not uncommon and appeared to be prevalent in broods. A friend and himself took twelve in one afternoon out of about 60 examined (all in the same spot).

Mr. F. J. Coulson exhibited four examples showing obsolescence of eye spots on hindwings undersurface, with two well developed for comparison; five examples with traces of additional spots on upper surface of hindwing; two examples tending to pale buff in colour; short series of undersides with aberrant apical dots, mostly within yellow rings; one with dots on both wings, three on left wing only, four on right wing only, others possibly showing a tendency to bipupillation, as in the two other examples shown.

Mr. T. H. L. Grosvenor exhibited forms from various continental localities, including race *lyllus* from Spain, and a form from Locarno having the underside of the hindwing of a deep brown; forms from England, males and females, showing bleaching in varying degrees; examples with ocelli large, others with ocelli absent, males with hindwings suffused with black, examples with four black interneural spots on the hindwings. Underside specimens with ocelli on forewings almost absent; with ocelli on forewings unequal in size; with basal third of forewings dusky, and others with dark median band; with ocelli duplicated and with one, two, and three extra ocelli on the forewings.

Messrs. O. R. and A. de B. Goodman exhibited nine separate series from widely distinct localities, four being Continental and five British, revealing great variation in the different races.

The specimens from the French Riviera from Nice to Hyères are characterised by a large and distinct apical spot and a fairly pronounced distal margin to all the wings. The undersides of the hindwings are sprinkled with sand-coloured scales. All the wings are wider and much more rounded than in British specimens. This constitutes the race named *lyllus*, which does not occur in Northern Europe, and is considered by some to be a subspecies, or even a distinct species. Other examples of race *lyllus* were from localities in the Pyrenees, alt. 4000 to 6000 feet, differing from the Riviera forms in having the apical spot much reduced and the distal margins and spot much fainter.

Specimens shown from the borders of Lake Maggiore, both in Italy and Switzerland, were much more darkly marked in the distal margins and apical spot, especially in the males. The undersides of the hindwings are almost unicolorous, and the median band is barely indicated, the scales being of a deep plum brown. This race is referable to the form *marginata*, and occurs in the summer brood in Southern Europe.

Messrs. Goodman's British *pamphilus* from East Dorset have the wings narrower and not so rounded as in the Continental races. The underside hindwings are greenish, and have a much more pronounced median band. Tring examples exhibit very faint apical spots and margins, but very dark green marking both on the fore- and hindwings on the underside, thus accentuating the median band.

From Cuffley and Theydon Bois, the examples are of small size, with the apical spots only just indicated; but with one exception the undersides are not so dark as those from Tring. One specimen is an example of the very rare aberration showing "Homoeosis," taken by A. de B. G. this June, at Theydon Bois; it will be observed that the right hindwing underside contains two blotches of yellow scales similar to those of the upper wings.

Specimens from Caterham, taken on the occasion of the Society's Field Meeting there, although worn, are even darker on the underside than the Tring specimens, one being very heavily dark scaled on the basal half of the forewings.

Those from Horsley appear to be intermediate between those from East Dorset and Tring.

Captain Crocker exhibited long series of aberrations; and remarked that he found less variation in the specimens taken this year than occurred in 1922.

Messrs. Frohawk, Buckstone, and Barnett, also exhibited series of *C. pamphilus*.

Mr. Hy. J. Turner exhibited long series from many British and Continental localities; and read extracts from his notes (see p. 39) referring to diagrams showing the relationship of the European races as made out by Dr. Verity; also showing how in the neighbourhood of Florence the intensive study of the four or five appearances, proved that such did not mean five broods, but only two, with perhaps a partial third. (See plate.)

Mr. Step exhibited a spider (*Epeira* sp.) to illustrate what he considered to be an improved method of preservation. The specimen was carded, but the abdomen had not shrunk, as is usual with Arachnids set dry. The method described was to kill in methylated spirit to which had been added about 10% of a saturated solution of bichloride of mercury, and to leave the spider immersed for a week. A shorter immersion gave partial contraction and loss of markings. The specimen, which had been out of the bath for two weeks, showed little, if any, sign of contraction or loss of pattern. He thought that this method of preservation, or some improvement of it, might make the spiders a more popular group with collectors.

Mr. Frohawk exhibited two specimens in very good condition of the continental "Skipper" *Erynnis alceae*, taken this year in Surrey, by Baron Bouche.

Mr. Stanley A. Blenkarn exhibited the following Coleoptera:—*Chrysomela marginalis*, taken on *Linaria*, at Brighton, September 2nd, 1923; an all black variety of *Adalia bipunctata*, taken at Coulsdon, July 11th, 1923; *Apion semivittatum* on *Mercurialis annua*, Deal, September 15th, 1923. This latter species occurs rarely in Central and South Europe and Algeria.

Mr. L. W. Newman exhibited a living female of *Boarmia gemmaria* (*rhomboidaria*), bred on October 11th, under natural conditions. It pupated in a sleeve out in the open. This was the first instance of a second brood in this species he had met with.

On behalf of Mr. Frederick A. Parker, Mr. Step exhibited two specimens of *Selaginella lepidophylla*, from Mexico, named "Resurrection Plant," because of the rapidity of their expansion in moisture after being curled up and apparently lifeless in dry weather. In an hour after being placed in water they are quite green, as one of the specimens sent. The other was in the dry state.

Mr. Enefer exhibited the bird's-nest fungus, *Cyathus striatus*, one of the Gasteromycetes. It grows on the ground among decaying fir-wood, and consists of a thimble-shaped cup, at first covered by a whitish membrane, which on bursting discloses a number of nearly flat bodies placed like eggs in a nest, containing spores, and attached to the "nest" by long cords.

Mr. Frohawk reported that *Anosia archippus* (*plexippus*) had occurred in Sussex this autumn; and he had been told in large numbers this year in N. America.

OCTOBER 13th, 1923.

Fungus Foray—Ashtead Forest.

Conductors, Messrs. H. Candler and E. Step, F.L.S.

Following a long spell of wet and cold weather, a beautiful, sunny day rewarded the nine members and several friends who attended. The recent conditions had been wholly unfavourable to fungus development, and little of special interest was noted, though the party had a most enjoyable ramble along the rides of this splendid woodland, where many ancient oaks of great girth still tower over younger growth, and give an idea of what the forest was like in former days. Among the species of fungi met with may be mentioned: *Fistulina hepatica* and *Polyporus dryadeus*, common on old oaks: *Clitopilus orcella*, *Tricholoma flavobrunneum*, *Amanita phalloides*, *Clitocybe flaccida*, *Boletus scaber*, *Russula nigricans*, *R. emetica*, *Laccaria laccata*, *Collybia maculata*, *Paxillus involutus*, etc. *Gyrodon sistotrema* and *Mutinus caninus*, which had been observed a few days earlier, and left for the Foray, were not encountered.

Beating the young birches and sallows was practised by the entomologists, and a number of larvae were obtained, including those of *Drepana lacertula*, *Notodonta ziczac*, *N. dromedarius*, *Lophopteryx camelina*, etc.; while imagines of *Peronea ferrugana*, *Teras reticulana* (*contaminana*), *Sarrothripus revayana* (1 very dark form), *Pterophorus monodactylus*, etc., were captured. A specimen of *Pyrameis atalanta* was tempted out to visit some flower-heads in a gleam of sunshine which reached an open space among the trees.

Among the miscellaneous contents of the beating trays were two specimens of the beautiful green, wingless, long-horned Orthopteron, *Leptophyes punctatissima*.

OCTOBER 25th, 1923.

Mr. K. G. Blair, B.Sc., F.E.S., Vice-President, in the Chair.

Mr. Tonge exhibited a short series of *Sphinx ligustri*, bred from a batch of ova obtained from a wild normal female, taken at Cadgwith, Cornwall, showing a complete replacement of the normal pink coloration on the hindwings and abdomen by cream colour.

Mr. Enefer exhibited a living example of a *Mygale* spider, found in a consignment of bananas at a fruit stores in Birmingham. The bananas had been shipped at Port Simon, Costa Rica.

Mr. Ashby exhibited a series of *Phytodecta pallida* (Col.), taken by beating hazel in Glen Nant, near Tayniult, on June 14th and 20th this year. Eight specimens with very dark markings were exhibited, including a dark form ab. *nigripennis*, Wse.; others with a dark thorax, and one with a confluent black spot on the elytra, ab. *borealis*, Wse. Some specimens when taken were of a red colour, which subsequently faded. These forms are described by Reitter, and known to occur in Northern Europe, but they do not appear to have been previously noticed in Great Britain.

Messrs. Buckstone, Mera, and R. Adkin, exhibited long series, broods, forms, races, and aberrations of the "Ermines" *Diaphora* (*Spilosoma*) *menthastri* and *D. lutea* (*lubricipeda*), to illustrate a paper by the last-named, entitled "The White and Buff Ermines: Some Notes on their History and Variation." (See page 55.)

A considerable discussion took place.

NOVEMBER 8th, 1923.

Baron J. A. Bouche, of Godstone, Mr. T. A. Nash, of Richmond, and Mr. D. G. Sevastopulo, of Gloucester Terrace, W., were elected members.

Mr. T. H. L. Grosvenor exhibited a large number of Lepidoptera, some bird's eggs, and other items illustrative of his paper on India read later in the evening.

Mr. Mera exhibited a melanic form of *Boarmia repandata* from Durham; also specimens of a partial second brood bred this year from the same strain. The latter were not so dark as the Sheffield race, but darker than any southern specimens. The second generation were somewhat smaller in size.

Mr. Barnett exhibited series of *Plebeius aegon* (*argus*) from Oxshott and Eynesford, contrasting the heath and the chalk forms; also a selection of *Xanthorhoë fluctuata* from various localities.

Mr. Step exhibited the Mosquito-Bug, (*Helopeltis theivora*), of which he had received specimens from our fellow member, Mr. W. Miles, Calcutta. He said that this hemipteron is one of the chief troubles of the tea grower; the eggs being embedded in the tissues of the plant, and the bug, in all its stages, sucking at its juices to such an extent that growth is checked and the leaves are rendered unsuitable for plucking. Unfortunately, it appears to have no natural enemies whose services could be enlisted in the effort to keep it down. Attention was directed to the long pin-like process that stands up from the thorax, and makes its appearance at the first ecdysis,

Mr. Hy. J. Turner exhibited a few specimens from a chance collection of Lepidoptera, obtained for him in West Africa.

I. Four different species of black and white Butterflies of four different families showing Müllerian Mimicry, of which, the model was the Danaid *Amauris niavius* a species protected by its distastefulness to birds, etc. The mimics were, (1) the Papilionid, the female of the *hippocoon* form of the polymorphic *Papilio dardanus*; (2) the

Nymphaline race *anthedon* of *Hypolimnas dubia*, and (3) the Satyrid, *Elymniopsis bammakoo*.

II. Two specimens of a Lycaenid, *Larinopoda* sp., which, on account of its general white coloration with only a few sparse markings and its aberrant appearance, had been classified by some systematists among the *Pieridae*. Recently Dr. Eltringham had dealt with this species, in a paper read before the Entomological Society of London, and had shown that it was a true Lycaenid.

Mr. T. H. L. Grosvenor then read his paper entitled "Natural History of the North West Provinces of India." (See page 63.)

NOVEMBER 22nd, 1923.

ANNUAL EXHIBITION.

Messrs. C. R. and A. de B. Goodman exhibited five cases of butterflies taken this year on the continent, comprising 37 spring species from the Riviera and Southern France; 44 summer species from the environs of Lake Maggiore; and 41 species from the high elevation of the Engadine in and around Pontresina. The exhibit included :—

"FROM THE RIVIERIA, etc.—*Thais polyxena* race *cassandra*, taken in March, in the Mountains of the Moor, near Hyéres. *Euchloë crameri* (*belia*) and its form *ausonia*, showing the difference in green hindwing markings. *Leptosia sinapis*, from Digne, with pure white ab. ♀ *erysimi*. *L. duponcheli*, showing the difference in shape of wing and the yellow flush at the base on the upperside. *Melitaea phoebe* and *M. cinxia*, with large ♀ s. *M. aurinia* race *provincialis*, of very uniform coloration. *M. parthenie* from the Basses Alpes. *Dryas pandora*, a very swift species, difficult to take, from the Val D'Argens, var. *Argynnis niobe* ab. *orientalis*. *E. jurtina* race *hispulla*, a very curious bleached specimen, showing symmetrical failure of pigmentation in central areas of all the wings. *Scolitantides orion* race *ornata*, the spring brood. *Glaucopsyche melanops* and *G. cyllarus*, for comparison. *Polyommatus* (*Agriades*) *thetis*, with very handsome blue suffused ♀. *P.* (*A.*) *coridon* with pale margins, from Digne. *Hesperia sidae*, with orange underside markings. This species is considered rare, but seems to occur over grassy clearings fairly frequently in the Riviera. *Thestor ballus*, the early copper, showing the great difference between the sexes.

"FROM LAKE MAGGIORE.—*Papilio machaon*, a very small specimen.

Argynnis cydippe and form *cleodoxa*. *Dryas paphia*, from Viergeletto, 2,000 feet, near Locarno, where all the ♀ s were of the *valezina* form. *Satyrus cordula* and *Enodia dryas*. *Colias croceus*, with a very fine male having two black spots at the anal angle of hindwing, and *helice* females, and a miniature male. *Neptis lucilla*, found in early August, too late to take this rarity in good condition. We found it not uncommon locally at Reazzino and Bignasco, 1500 feet. *Leptosia sinapis* with form *erysimi*, very large. *Erebia neoridas*, fine and large from Bignasco. *B. ligea*. *Melitaea phoebe*, showing great variation. *Brenthis euphrosyne*, of the autumn emergence. *Heodes alciphron* race *gordius*, *H. virgaureae* and *H.* (*Loweia*) *dorilis*, with females showing great brilliance. *Polyommatus hylas* and *P. icarus*, large races. *Lycaenopsis* (*Cyaniris*) *argiolus*, large ♂ with diminutive ♀. *Scolitantides orion*. *Heteropterus morpheus*. We were able to take half a dozen worn specimens of this skipper at Reazzino, through the Rev. G. Wheeler's kind guidance.

"From Pontresina.—*Parnassius delius*, ♂ and ♀ with very heavy markings, from the Val Roseg and Val del Fain. *Colias palaeno* and *C. phicomone*, showing great variation in ground colour of the latter species. *Argynnis niobe*, type and var. *eris*, with a small abortive male. *Brenthis pales*, type and form *isis*. *B. thore*; we were lucky in getting nine worn specimens in the Val Roseg, although the date was so late. *Melitaea asteria* and *M. varia* from the Schafberg. *H. virgaureae* and *H. hippothoë*. *Coenonympha satyrion* and race *darwiniana*. *Lycaena euphemus*, *P. pheretes*, *Plebeius donzelii*, *P. optilete*, and *P. eros*.

"We also exhibit a very worn specimen of *Lampides telicanus*, taken by my son in the Val del Fain, at a height of about 8,500 feet on the Bernina Pass. I think this must be a record for altitude.

"Of the species of *Erebia* exhibited, those of note were—*E. euryale* ab. *euryaloides*, *E. gorge* var. *triopes*, *E. tyndarus* ab. *caecodromus*, and a specimen of *E. alecto*, from the top of the Schafberg, 9,000ft."

Mr. A. E. Stafford exhibited a short series of aberrations of *Polyommatus* (*Agriades*) *coridon*, taken at Royston in August, 1923.

Mr. Worsley-Wood exhibited three *Xanthia* hybrids, *Mellinia* (*Xanthia*) *ocellaris* ♂ and *X. fulvago* ♀; and communicated the following note:—"Some 70 ova were laid on July 15th, 1923. More than half the larvae hatched prior to October 8th, and were lost. Between October 13th and November 20th 33 hatched. The first ten were lost before the proper method of feeding was discovered. It underwent the second change of skin successfully, but of these 14 died without attempting to feed again. Of the remaining seven, six fed up rapidly and were full fed by Christmas, the other lingered on into February and then died. On February 5th six cocoons were taken up, from which emerged a ♂ on April 3rd, another on April 12th, and a ♀ on April 28th. The remaining cocoons contained a dried up larva and two pupa, black and putrid. The larvae in all stages were not to be distinguished from those of the female parent *fulvago*, and *fulvago* characters are dominant in the hybrid.

"Attempts to repeat the cross this year resulted in failure, but some interesting forms of *X. ocellaris* and *X. fulvago* were bred, and are shown below.

"The most noteworthy one perhaps, is an *X. ocellaris*, with all the usual markings absent, except the dot in the reniform, which agrees fairly well with the ab. *palleago* of Hübner, fig. 192; and no. 8, a *X. fulvago* with heavy red band on a cream ground, thorax and hindwings white.

"No. 5, an extreme form of *X. ocellaris* ab. *lineago*, Gn., was bred in 1920, a reward for another failure."

Mr. J. J. Lister exhibited (1) a series of Lycaenids *Polyommatus coridon*, *P. thetis* (*bellargus*), *Plebeius* (*Aricia*) *medon*, *P. pheretes*, and *P. argus*=*aegon*, and the Hesperiid *Urbicola comma*, illustrating the striate form of aberration; (2) some variants of *Thestor ballus*, from Costabelle; (3) some variants of *Zerinthia* (*Thais*) *polyxena* var. *cassandra*, from Costabelle; (4) a specimen of *Melitaea dictynna* showing melanic variation of the forewing.

Mr. H. A. Leeds exhibited a large number of aberrations of British Rhopalocera, all captured during 1923, including the species *Epinephele jurtina*, *Strymon pruni*, *Euchloë cardamines*, *Aphantopus hyperantus*, *Polyommatus* (*Agriades*) *thetis*, *P. icarus*, *Plebeius* (*Aricia*) *medon*, *P. argus* (*aegon*), *Heodes* (*Rumicia*) *phlaeas*, and a series of *P.* (*A.*) *coridon*, illustrating an intensive study of the minor aberrations of the species, with an application of Courvoisier's suggested descriptive terms with Tutt's names.

Polyommatus (*Agriades*) *coridon*, Herts: — [(C)=Courvoisier's descriptive terms in "Die Schmetterlinge der Schweiz," Bern, 1922.*]

♂ Uppersides :—

1. *marginata*, Tutt.
2. *major*+cinnamon borders and suffusion.

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* [Couvoisier's terms are *not* names but descriptive words and hence are *not* italicised.—Ed.]

3. *grisea*, Tutt.
4. White wedges interior to all outer borders.

♀ Uppersides:—

1. *inequalis* (several long streaks between apex and base L. f.w.), Tutt.
2. *subaurantia-semisyngrapha* (L.wings) *roystonensis*.
3. *tithonus* (*syngrapha*).

♂ Undersides:—

1. *bilineata-I-nigrum-basijuncta*, Tutt.
2. antico-paucipuncta.—limbojuncta, C.
3. basielongata-radiata, C.
4. caeca, C. = *corydonis*.
5. digitata, C.
6. paucipuncta, C.
7. *pallida-I-nigrum-obsoleta*, Tutt, + all outer borders almost minus the black dots.
8. *fuscescens-postico-obsoleta*, Tutt.

♀ Undersides:—

1. *unipuncta-discreta-postico-extensa*, Tutt.
2. antico-radiata-postico-parvipuncta-limbojuncta, C.
3. caeca, C.
4. antico-discoelongata-pluripuncta-dextro-discojuncta, -postico-paucipuncta, C.
5. *discreta-obsoleta-coronetta*, Tutt.
6. basielongata-discoelongata, C.
7. *tripuncta-coronetta-postico-parvipuncta*, Tutt + smooth closely scaled creamy-white ground colour all wings.
8. *castanea-semiarcuata*, Tutt.
9. *discreta-obsoleta*, Tutt + postico-(uni-) radiata, C.
10. caeca, C.
11. *discreta*, Tutt. An extreme form, most of the spots touching the chevrons.
12. *impuncta-antico-discreta-postico-obsoleta*, Tutt + white radiate streaks running inwardly from chevrons on hindwings.
13. antico-caeca-postico-sinistro-radiata, C.

Mr. Robert Adkin exhibited—

(*a*) Representative series of two broods of a second generation of *Diacrisia mendica*, mongrel race *mistura* ("Proc.," 1922, p. 126). The males closely followed the lines of the first mongrel generation, in that they were of all shades of grey from whitish- to quite dark-grey. In many of the specimens the costa, fringes, and larger veins were distinctly lighter than the ground colour, but in a few of the darkest individuals this was not so, they being completely dark smoky-grey, differing little from typical *mendica*. The females appeared to have completely lost the dark veining typical of the race *venosa* female, and generally differed little from typical *mendica* females, but in some small proportion of them the spotting was somewhat heavier than is usual, and in a still smaller proportion a few of the spots were slightly inclined to form streaks, thus tending towards a radiated form. There was no tangible difference between the two generations. Also representatives of a brood reared from a South Wales female, of which the males were of the dark smoky typical *mendica* colour, but the females were, in many cases, somewhat heavily spotted.

(*b*) An aberration of *Pyrameis atalanta*, bred from a wild Eastbourne larva, in which the large white costal blotch was largely obscured by black scales. For comparison with it he showed an artificially produced aberration, in which the costal blotch was completely obscured and the red band slightly distorted; a form known as *klymene*, Fisch., which Seitz says "so far appears to be only known as a product of experiments with low degrees of temperature," but an exactly similar one is figured by Barrett from a specimen in the late S. Stevens' collection, and one very similar by Mosley, from a specimen taken near Oldham, by Chappel, many years ago.

Mr. Holford exhibited an extraordinary and unique aberration of *Triphaena pronuba* of an extremely black-brown suffusion over all the wings, the usually bright orange area of the hindwings being reduced to obscure traces towards the base of the hindwings.

Mr. R. T. Bowman exhibited a beautiful form of *Abraxas grossulariata* with striated upper wings.

Mr. Thos. Greer, of Co. Tyrone, exhibited aberrations and series of Lepidoptera from Ireland, and contributed the following notes on the species:—

Pieris napi.—Series of light and dark forms, spring and summer emergence, males with extra spot on forewings, female with two extra spots on hindwings; female pale yellow, male with the two additional spots joined together.

Euchloë cardamines.—A varied series including the new ab. *schepdaeli*, also ab. *caulotosticta*, ab. *radiata*, and ab. *quadripunctata*, females with yellow costa, two females blotched and streaked with orange.

Melitaea aurinia.—Series of light and dark forms, including var. *virgata*; forms with marginal spots on hindwings obsolete.

Pararge megera.—Extra spotted and bi-ocellated forms.

Epinephele jurtina.—Series, both male and female, of ab. *addenda*, male with ocelli on hindwings: male with fulvous band on hindwings. A series approaching race *hispulla*.

Coenonympha pamphilus.—Male with spots on hindwings upperside; varieties of underside.

Polyommatus icarus.—A series of undersides, including a number of ab. *icarinus*; *postico-obsoleta* and a streaked form.

Mr. D. Pearson, of Chilwell, Notts., exhibited series of bleached *E. jurtina* ♂ and ♀, one female underside with two additional spots; *Brenthis euphrosyne*, one with dark lower wings; *Polyommatus coridon*, one with ♀ wings on left ♂ on right, one ♂ dull with blue patches in upper wings; series of *M. aurinia*, some very dark, one obsolete underside; black *Limenitis sibilla*; *Vanessa io*, one with green replacing blue in eye spots; *Aglais urticae*, dark hindwings and large blotches; *Euchloë cardamines*, ♀ with orange patches; series of *Polyommatus thetis*, blue ♀s, and streaked and obsolete undersides; *P. icarus*, fine streaked undersides; *H. phlaeas*, ab. *alba*, one white wing, dull brown instead of copper, two black hindwings; *Plebeius sephyrus* race *lycidas*, from Berisal; *Erebia christi*, Laquinthal; *Coenonympha arcania* var. *darwiniana*, variable, one with three spots on upperside of forewing; *Pieris napi*, with yellow forms from Donegal; *M. dictynna*, light and dark forms; *M. athalia*, varied upper and undersides; *Pararge aegeria*, dark ♂ and very light ♀s; *E. ceto*, one from Simplon with spots in lower wings nearly round; *Lycaena arion*, British, and dark continental race *obscura*.

Mr. A. E. Tonge exhibited a long series of *Polyommatus* (*Agriades*) *coridon* aberrations from Royston, August, 1923, chiefly ab. *obsoleta*, a fine symmetrically striated underside ♂, and several ♀s with partial ♂ scaling. He stated that var. *cinnus*, in which the hindwings below were ab. *obsoleta*, was unusually abundant this season; a short series of *P.* (*A.*) *thetis* (*bellargus*) from the N. Downs, near Reigate, including one *obsoleta* and four blue suffused ♀s, and two ab. ♂ *polonus*, Zell.; *Coenonympha pamphilus* with two black spots in the submargin on upperside of hindwings, and additional spots on the underside of forewings; *Colias croceus*, the only two taken by him this year, Folkestone and Lewes; *Cleora jubata* (*glabraria*), an aberration with extremely aberrant, suffused, and extended markings, from the New Forest, July, 1923.

Capt. W. Crocker exhibited, on behalf of Mr. C. W. Sperring, a very variable series of *Pararge aegeria*, bred from S. Devon parents; two black suffused *Brenthis euphrosyne* and a few *Plebeius argus* (*aegon*) ♂ s, from the chalk district, illustrating range of colour from leaden to violet blue: also a ♂ with the usual marginal border entirely absent.

Mr. C. H. Williams exhibited series of *Heodes* (*Rumicia*) *phlaeas* and *P.* (*A.*) *coridon* in great variety.

Mr. A. A. W. Buckstone exhibited a series of the newly differentiated species *Anaitis efformata* with a series of *A. plagiata* (two broods) with which it has hitherto been confused. He quoted the points of distinction as given by Dr. Jordan in the "Proc. Ent. Soc. Lond.," pt. V. 1923. "In the true *A. plagiata* the claspers of the ♂ are very long, narrow, tapering, and are forked at the tip, ending with two sharp, thornlike teeth, and the last external (7th) abdominal segment of the ♀ is long. This species occurs in a larger spring form (1st brood) and a smaller summer form (2nd brood). The second species is about as large as the summer form of *A. plagiata*, but differs in the ♂ claspers being short and broad, and ventrally deeply sinuate beyond the middle, the clasper ending with a broad somewhat spathulate lobe; in the ♀ the seventh (last external) abdominal segment is shorter than in *A. plagiata* ♀. On the whole this second species is the paler of the two, but there does not seem to be any constant difference in colour or pattern."

Mr. Buckstone then exhibited on behalf of Mr. and Mrs. Castle Russell, the following aberrations of British Lepidoptera, all of which were captured wild, or bred by the exhibitors during the last two seasons.

Dryas paphia.—Melanic males, etc., New Forest, 1923.

Epinephele jurtina.—Female with much extended orange colour on the forewings, and male with abnormal markings resembling female, Andover, 1923.

Brenthis euphrosyne.—Two pale and a striated form, Newbury district, 1923.

B. selene.—Nine aberrations, pale and melanic coloring, etc., Newbury and Reading districts, 1922-1923.

Melitaea aurinia.—A specimen with upperside heavily suffused with black and having remarkable underside; bred, Petersfield, 1922. Six aberrations from Wilts and Hants.

Polyommatus (*Agriades*) *coridon*.—A pale yellow and french grey form, from the Chilterns, 1922. Various upper- and underside aberrations, including *striata* and *obsoleta* forms, from Wilts and Hants, 1923.

Polyommatus icarus.—Underside aberration, Andover, 1923.

Heodes (*Rumicia*) *phlaeas*.—Aberrations from Andover district, 1922-3.

Coenonympha pamphilus.—A pale form, and one with heavy marginal markings, 1922.

Mr. Buckstone also exhibited blackish suffused forms of *Heodes phlaeas* and one approaching ab. *schmidtii*, from Wimbledon; aberrant forms of *Pyrameis atalanta*, including one with a red streak on the underside of the left hindwing; a smoky suffused *Dasychira pudibunda*, bred from Horsley; and an asymmetrical *Fidonia carbonaria*, from Rannoch.

Mr. A. W. Vernon exhibited a few species of Rhopalocera taken during the latter part of last July, in the Stubaithal, Austrian Tyrol, including *Melitaea aurinia* race *merope*, *Brenthis thore*, *B. pales* with var. ♀ *napaea*; also *Erebia lappona*, *E. pronoë* with the especially dark form *pitho*.

Mr. A. W. Mera exhibited a cabinet drawer containing a few species that have developed, in more or less recent years, a marked tendency towards melanism.

Hybernia defoliaria, from Epping Forest, with black bodied females, is a form which was quite unknown forty years ago, and the dark ones are increasing each year.

Epirrita (*Oporabia*) *christyi*, from Buckinghamshire, is I believe quite a new development, taken by myself last year.

E. (*O.*) *autumnaria*, from Middlesborough, and *Larentia multistrigaria*, from Yorkshire and Morpeth.

None of these forms are mentioned or figured by Edward Newman in his book which was published in 1869.

Capt. A. T. Hemming exhibited striate aberrations of British Lycaenids, showing the two forms which striation can assume, *viz.*, (*a*) internal and (*b*) external. So far as the British species are concerned there can be no question that the internally striate forms, where the spots of the submedian row on the underside are extended in streaks towards the discoidal spot, are of less rare occurrence than the externally striate form, in which the submedian spots are elongated towards the outer margin.

P. (*A.*) *thetis*, Rott. One ♂ showing marked internal striation on forewings, Tonbridge, Kent, August 24th, 1911, and one ♂ exhibiting external striation on all wings, Dorchester, September 3rd, 1921.

P. (*A.*) *coridon*, Poda. One ♀ taken in August, 1909, near Folkestone, showing partial internal striation on the forewings ; and one ♀ taken at the same time and place, showing complete external striation on all wings.

Polyommatus icarus, Rott. Two ♀s, taken at Reigate Hill on August 31st, 1910, and September 15th, 1909, respectively, the former showing incipient internal striation on the forewings, and the latter more complete external striation.

Plebeius argus (*aegon*), L. Two ♂s, taken in July, 1908, in North Kent, and on July 9th, 1921, at Dorchester, respectively, showing partial internal striation on hindwings; and two ♂s, taken on July 7th and 12th, 1921, near Dorchester, showing external striation on forewings.

Mr. L. W. Newman exhibited a curious aberration of *Arctia caja*, with zig-zag white markings near apex of forewing, and a large streak of white running part of the way from costa into the thorax, otherwise forewings all brown, hindwings fairly normal.

Mr. H. Candler exhibited eggs of the black-headed gull (*Larus ridibundus*) from Scoulton Mere, near Hingham, Norfolk, showing remarkable variation in colouring, and said—"The eggs are regularly 'farmed' for the Norwich market up to a certain date, when the birds are allowed to breed; and it seems probable that the variation may be due to the exhaustion of the colouring pigments caused by the abnormal number of eggs laid by the birds under these conditions. I have not observed any such remarkable range of coloration in the eggs of other species of gulls laid under normal conditions."

Mr. Garrett exhibited a fine ab. *schmidtii* of *Heodes* (*Rumicia*) *phlaeas* from Bexley, Kent.

DECEMBER 13th, 1923.

Mr. Geoffrey Vredenburg, of Maida Vale, and Mr. Willoughby-Ellis, were elected members.

Mr. Hugh Main exhibited a whip-scorpion, *Phrynus reniformis*, sent to him from Trinidad by Dr. Withycombe. The whip-scorpions are a family of Arachnida nearly related to the Scorpions, and are capable of inflicting painful wounds. They occur in the tropics of both hemispheres. They are characterised by their excessively long whip-like, multiarticulate fore legs, which apparently perform the functions of antennae.

Mr. D. G. Sevastopulo exhibited a specimen of *Pyrameis atalanta* ♂, which has the sub-apical spot missing; it was taken at Horley, August, 1920; an *Abraxas grossulariata* ♀, with the right forewing normal, the right hindwing showing traces of a yellow band, the left forewing with the usual yellow streak almost obsolete and replaced by a yellow patch in the middle of the white marginal band, and the left hindwing with a very slight trace of yellow band, and with three more black spots than the corresponding right wing; it was bred from a London larva in June, 1923; and a *Pararge megera* ♂, with the forewing with a greatly enlarged eye-spot and all the area within the sexual brand suffused with brown, the veins heavily marked with brown scales, the hindwings suffused with brown, leaving only fulvous rings around the spots, which, with the exception of nos. 2 and 3, are almost obsolete; it was taken at St. Germain, France, in June, 1922.

Mr. A. L. Rayward exhibited (1) *Epirrita* (*Operabia*) *autumnaria*, Bkh. A short series of ♂ s from Surrey, showing a range of colour variation from an almost white ground to a very dark suffused grey; together with several *E.* (*O.*) *dilutaria* from Surrey and Kent for comparison. Attention was drawn to the difference in markings, and especially in size, *autumnaria* being considerably the larger insect. Preparations of the genitalia of both species were shown under the microscope and their differences were quite apparent.

(2) *Anaitis plagiata*, L. Examples from Surrey, Sussex, and Westmorland, accompanied by several of a second species which, until recently, has been confused with it, and which it is considered may be *A. efformata* of Guenée. Both species were flying together in the Sussex locality, and both appear to be double-brooded. Preparations of the genitalia were also shown in confirmation.

Mr. Robert Adkin exhibited a series of *Arctia villica* representative of a number that he had reared in June last.

He said that, from the beginning of February to the end of March. larvae were quite abundant on the Parades at Eastbourne, when anything from a score to forty or more might be picked up as they crawled over the gravel paths on any sunny afternoon, and a considerable number were so obtained. Early in March it was noticed that many of the larvae that had been collected were parasitised, numbers of clusters of cocoons of the hymenopteron *Apanteles caiae*, Bouché, being found on the sides and top of the breeding cage, and even on the moss with which the bottom of the cage was covered. At the end of April several dipterous parasites (probably *Carcelia cheloniae*, Rud.), appeared; and again early in May a second emergence of *Apanteles caiae* from their hosts was observed. This appears to suggest that the *Apanteles* may deposit its eggs in the young lepidopterous larva before hibernation, the parasite passing the winter in its host, and coming forth at the beginning of March. That is, the imagines of this emergence attack the healthy lepidopterous larvae of the same brood, then being in the penultimate instar; thus giving the parasitic larvae time to feed up and quit their hosts by the time that the lepidopterous larvae are ready for pupation. If this be so, as appears to be the case in this instance, two generations of the parasite may succeed in one generation of the host, this circumstance may be a potent factor in the thinning down, almost to extinction, that occasionally takes place in this and some other species of Arctiids. He estimated that fully 70 per cent. of the *villica* larvae collected were parasitised. Many that, when found, were obviously sickly, were rejected, so that the actual percentage was probably much higher than the estimate above. *Arctia caia*, which he was unable to find last year, was this year obtained in small numbers.

With reference to variation in the specimens reared, he said there was nothing extreme, but many minor points were to be noted. Thus, while many specimens of both sexes had the mid-costal spot more or less well defined, in others it was completely absent. Two specimens had the basal spots confluent, while in two others all the pale spots were of a slightly smoky tinge. One specimen had the outer spots connected by a narrow white streak, and in another the black apical margin of the hindwings was complete.

Mr. H. W. Andrews exhibited the very rare dipteron *Agathomyia elegantula*, Fall., one ♂ from Farningham, taken on September 1st, 1923.

Mr. Parker exhibited the following aberrations of Rhopalocera. *Aphantopus hyperantus*, an absolutely black form with all the eye-spots suppressed; another aberration of the same species, of a very deep mahogany colour; a radiated specimen of *Brenthis euphrosyne*; a female aberration *Euchloë cardamines*, with streaks of male colour; and a *Mimas tiliae* of a rich chocolate colour.

Mr. Blenkarn exhibited the following aberrations of British

Coleoptera. *Nebria gyllenhalii* var. *rufescens*, Ben Lomond, June 21st, 1917, and var. *balbii* (legs red), Ben Lomond, July 17th, 1915; *Bembidion lampros* var. *velox* (*prosperans*) (7 striae instead of 6), Hendon, a dull form, May 3rd, 1902, and Luccombe Chine (typical form), July 8th, 1917; *Harpalus latus* var. *metallescens*, Box Hill, September 9th, 1923; *Calathus melanocephalus* var. *nubigena*, Mickleham, June 29th, 1913; *Sphaeridium scarabaeoides* var. *bipustulatum*, Ranmore (smaller, darker with spots obscure), October 7th, 1921; *Philonthus quisquiliarius* var. *inquinatus* (*dimidiatus*), Studland (elytra red), November 7th, 1923; *Cafius xantholoma* var. *variolosus*, Swanage (lightly developed form of male with large head), September 7th, 1910; *Lathrobium terminatum* var. *atripalpe*, Studland (no yellow spots on the elytra), November 7th, 1923; *Grammoptera ruficornis* var. *holomelina* (all black form), Box Hill, May 16th, 1921; *Galerucella nymphaeae* var. *fergussoni*, Possil Marsh, Glasgow, June 2nd, 1910; *Apion aestivum* (*trifolii*) var. *ruficrus* (dark yellow legs, black tibiae), a form new to Britain, Coulsdon, August 8th, 1923; *Strophosomus curvipes* var. *aeruginosus*, Arran, June, 1900; together with typical specific forms of each species for comparison.

Mr. Hugh Main then read a paper, "A Pilgrimage to Provence," and showed numerous slides of the insect and spider fauna of La Sainte Baume, a delightful place of pilgrimage some few miles north-east of Marseilles. The object of his visit was to see, in their habitats, some of the creatures so incomparably described by M. Fabre in his "Souvenirs Entomologiques." He first dealt with the Field Cricket, which for a time proved a most elusive subject, but subsequently an interesting series of photographs of both sexes at home were secured, and notes taken of their various domestic arrangements in and around cavities made by the insects in sunny spots. Some holes in the hard soil, on investigation, contained Fabre's "Blackbellied Tarantula," a large Wolf-spider, which, with careful coaxing, afforded the opportunity for another series of interesting slides of the "beastie" at home, after having made a vertical section through the burrow. Heaps of large stones afforded numerous objects for the camera. Little black scorpions, there often met with, made interesting pets to watch their capture of flies, their care of their offspring, etc. The fat larvae of the Rose Chafer and quaint little Natter-jack toads were often turned up. Near Hyères the little Green Tree-frogs were abundant among foliage. Processions of ants were numerous, and the observations recorded by Moggridge in his "Harvesting Ants and Trapdoor Spiders" could readily be verified by the observant naturalist. The seed-collecting ant, *Atta barbara*, was in streams, storing in their underground granaries, the seeds of the spreading plane-trees. Some of the Bull-beetle *Onthophagus*, were brought home. They took readily to the lecturer's terrarium, and points left unsolved by Fabre in their domestic economy were observed and photographed at leisure. In conclusion it was urged that the evidence of the camera was worth more than many pages of description.

Mr. R. Adkin (delegate) read a Report of the British Association Meeting held at Liverpool, September 12th to 19th, 1923.

BRITISH ASSOCIATION.

Report of the Society's Delegate,

By Robert Adkin, F.E.S.—*Read December 13th*, 1923.

I attended the ninety-first annual meeting of the British Association, which was held at Liverpool from Wednesday, September 12th to 19th. The whole meeting was a particularly good one, both as regards the interest of the proceedings, the local arrangements, and the number of members that attended.

The Presidential Address, delivered by Sir Ernest Rutherford to a vast audience in the Philharmonic Hall, on the evening of the opening day, was on "The Electrical Structure of Matter," and, for the first time in the history of the Association, was broadcasted throughout the length and breadth of the land.

As a Natural History Society, you will probably be chiefly interested in the proceedings of Section D, Zoology, and here, as in fact in all other sections, a very full and interesting programme was got through. The President of the Section, Prof. J. H. Ashworth, opened the proceedings with a masterly address on "Modern Zoology. Some of its Developments and its Bearings on Human Welfare." Then followed papers on a vast number cf subjects. Liverpool being a seaport, naturally many of them dealt with maritime matters, such as "Age, Growth, and Maturity of Herrings," by Mr. B. Storrow; "Plankton in Relation to the Food of the Herring," by Mr. A. C. Hardy; "Young Fish in the Channel," by Mr. R. S. Clark, and so forth. Other subjects discussed included, "Origin of Adaptations: Present Position of the Question in relation to Recent Research," by Mr. J. T. Cunningham; "The Meaning of the Transparent Under-Surface of the Wings of certain Butterflies," by Prof. E. B. Poulton; "Polyhedral Disease in the Vapourer Moths of the Genus *Orgyia*," by Dr. J. W. Heslop Harrison, a matter of very considerable interest to those of our members who busy themselves in the rearing of Lepidoptera from the egg. Mr. E. R. Speyer read a paper on "The Evolution of Aphids with Complex Life-Cycles"; Mr. A. D. Peacock on "Parthenogenesis in Sawflies"; and Dr. Stanley Kemp, "Notes on the Fauna of the Siju Cave, Garo Hills, Assam." It was very gratifying to meet our old member, Dr. Kemp, who, I gathered, had so arranged his holiday that he might be in England at the time of the meeting of the Association. These and many other equally interesting matters were discussed at length, but as they will no doubt be fully dealt with in the official Report of the meeting, which I hope to have the pleasure of presenting to you later on, I need say no more about them now.

Two meetings of the Conference of Delegates of Corresponding Societies were held, the first on Thursday, September 13th, and the other on Tuesday, the 18th. I had the pleasure of attending on both occasions. The usual formal President's address was dispensed with, and in its place the President introduced a discussion as to the objects for which we meet, and work that the individual societies may usefully do. Under the latter head it was suggested that, among other things, local societies might keep records of the earliest and latest dates of the flowering of plants and the appearance of insects. Study and record the distribution of dust particles, meteorological phenomena and rainfall, temperature, etc. Stimulate the public libraries to obtain the right sort of books, or to form an association through which such books may be obtained (Note.—There is already an arrangement by which the more technical books may be borrowed for reference through the local public libraries.) The duty of local societies to protect places of public interest in their respective neighbourhoods was urged, as was also the desirability of visits of one society to another. A joint scheme of publication (see Prof. Mac Bride's Report," Sec. D, Liverpool, 1893), and the exchange of periodicals and lantern slides between societies, were also discussed.

The following resolutions were dealt with :—

(1) To recommend that the publications of Scientific Societies should conform so far as possible to a standard size of page, for convenience in dealing with offprints; and that for octavo publications the size of the British Association's Report be adopted as the standard.—This was carried.

(2) To urge the adoption by Scientific Societies of the bibliographical recommendations contained in the current Report of the Zoological Publications Committee.—Carried.

The summary of the report reads, "Publication of a new systematic name is effective only when the volume, paper, or leaflet in which it appears is obtainable at a price in the way of trade by any applicant, or is distributed widely and freely to circles interested, it being always of a character suitable to the publication of such matter."

(3) To represent to His Majesty's Government, in view of recent proposals to utilise for naval, military, or commercial purposes, sites of historic or scientific interest, or of natural beauty, such as Avebury, Holmbury Hill, and Lulworth Cove and its neighbourhood, the urgent need of more effective protection of such sites from disfigurement or obstruction.—Carried.

(4) To request the Minister of Agriculture and Fisheries to reconsider his decision to discontinue the issue by the Ordnance Survey of quarter sheets of the six-inch map, on the ground that, if quarter sheets are not available, teachers, students, and others engaged in various kinds of research on local and regional distributions, will be put to expense and inconvenience in providing themselves with the sheets necessary for their work.—Carried.

(5) To represent to His Majesty's Government the urgent need for ample provision for the Science Museum, and for closer coordination between the principal national collections of scientific material.—Carried.

(6) To call the attention of local scientific societies to the need for prompt and systematic supervision, in the interest of scientific record, of all sections and other excavations which were opened during the construction of new roads or other public works.—Carried.

(7) To recommend the General Committee to accept the invitation received from the President of the Museum Association to hold the Conference of Delegates in connection with that Association's Meeting at Wembley, in July, 1924: without prejudice to any provision which may be possible for a Conference of Representatives of local societies at the Toronto Meeting.—Carried.

In conclusion I would take this opportunity to urge the claims of the British Association upon our members. For the very moderate annual subscription of £1 you have the privilege of attending the meetings and visiting many places of interest that otherwise are often not to be seen; or for 30s., all the above and the Annual Report, which contains a record of the papers read before the various sections, etc., and is of lasting interest. The meetings also afford opportunities for meeting kindred spirits that one seldom, if ever, sees elsewhere, and discussing with them topics of mutual interest. One hears, too, in the Presidential Addresses, and in the papers read before the Sections, the very latest information on the numerous subjects discussed. I am aware that it is not always possible for those engaged in business or professional activities to arrange their holidays to coincide with the meetings of the Association; but when they can I would venture to say that they would find it time not only well, but agreeably spent. For any one who has the time and money to spare, and the desire to make new friends and meet new ideas, the Toronto meeting of 1924 offers a unique opportunity; while for those less happily situated the meeting arranged to be held in Southampton in 1925, will be available. I have heard it said that the meetings of the Association are little more than a prolonged picnic; well, perhaps some happily disposed persons may endeavour to make it so, but I am fully convinced that no one who aspires to any degree of scientific study, be he amateur or professional, can afford to ignore the opportunities for keeping in touch with current opinion offered by the meetings of the British Association.

Special General Meeting.

Owing to an increase in the rent of the Society's rooms, the Council put a resolution before the meeting to amend By-law 8, by increasing the Annual Subscriptions by 2s. 6d. and the Composition Fee by 2 guineas. This, on the motion of Messrs. Tonge (Treasurer) and E. Step, was carried unanimously. The Subscriptions therefore now stand:—ordinary 12s. 6d., country 7s. 6d., and life £8 8s.

JANUARY 10th, 1924.

Miss Emily Chapman and Miss Laura Chapman, of "Betula," Reigate; and Mr. Thomas Greer, of Curglasson, Co. Tyrone, Ireland, were elected members.

Mr. Robert Adkin exhibited a short series of *Blastobasis lignea*, Walsm., a species recently introduced to the British list. The moth was discovered by Mr. A. E. Wright, at Grange-over-Sands, in

August, 1917, when a few worn specimens were captured; but in 1919 and 1920 specimens in better condition were taken, and these have since been identified. The moth appears to be attached to *Cotoneaster*, but it is not known whether that is the food plant of the larva. The species was previously known only from Madeira. I am indebted to Mr. Mansbridge for the series exhibited.

Mr. Enefer exhibited a 2 years old fasciated shoot of sycamore. The fasciation began in the first year's growth and continued in the second year, but became more pronounced. He also showed an umbellate form of Narcissus. The buds were scattered along and around the stem, and clustered about the growing point.

Mr. S. A. Blenkarn exhibited several of the species of Coleoptera mentioned by Mr. Main, in his paper on Provence, at the last meeting, including *Acanthocinus aedilis*, Phares, N.B., September 7th, 1922; *Onthophagus ovatus* and *O. fracticornis*, Padstow, May, 1923; *O. coenobita*, Box Hill, April, 1923; *O. vacca*, Padstow, May, 1922; and *O. nuchicornis*, Camber, May, 1922.

Mr. Hy. J. Turner exhibited a series of forms of *Pieris napi* recently received from Mödling some 15 miles south of Vienna. He said that the Mödling race was characterised by the extreme yellow forms which occurred there in some numbers in certain years, both in the spring brood and in the summer brood *napaeae*. The males were of the normal white colour and only the females were subject to this colour aberration. The spring yellow form was known as ♀ ab. *lutescens*, and was not so pronounced in colour as the summer form, but the veins of both fore and hind-wings were as a rule almost equally marked with dusky scales with a tendency to spread out. The individuals of this brood were also smaller and generally duskier. On the other hand, in the summer brood *napaeae*, the yellow forms were much yellower and brighter looking, the dark markings were black rather than dusky, there was considerable difference in the scaling along the veins which was on the hindwings often absent, or if not absent was always much less than such marking along the veins of the forewings. The individuals were larger and more robust, and the spots were always larger and more emphasised. This summer form was known as ab. *flavescens*.

One specimen of the summer brood which is dated 1909, is of a deeper yellow and may perhaps be identified with ab. *sulphurea* rather than ab. *flavescens*. There is a tendency to form a row of submarginal spots on the hindwings, a fairly well-developed spot occurs in the fourth interspace in several specimens, and traces occur in spaces two and six. An Irish yellow form is included, not ab. *flava* as shown in Kane's figure in the "Entomologist" in 1901, but a form of a pale greenish yellow which by daylight is very delicately pretty. It is a spring form and paler, and of a different texture from the spring form ab. *lutescens*. It will be remembered that Kane's ab. *flava* was a summer brood form (August); his figure is of a much deeper yellow than is ab. *flavescens*, the summer form of Mödling.

Specimens of the normal forms of the species at Mödling were also exhibited. Those of the spring brood were somewhat darker than ordinary British forms, whilst those of the summer *napaeae* were very considerably darker, probably comparable to the darker Scotch forms. A spotless ♂ was shown as ab. *immaculata* (spring) whether this should be called ab. *impunctata* like spotless Norwegian forms was not decided. A form was shown with a complete marginal blackish band joining the spots on the forewing, with a tendency to produce the same result on the hindwing by the swelling out of the black vein scaling in that area. It had been named ab. *meta* (summer). Two specimens of the form ab. *radiata* were shown, in which the veins of both fore- and hindwings, upper- and underside were equally emphasised by the dusky scaling (spring).

Mr. Buckstone exhibited, on behalf of Mr. Bayliss, a specimen of *Pieris brassicae*, in which a bright green colour had been developed irregularly in the neighbourhood of the nervures. He also exhibited specimens of the newly differentiated species *Anaitis efformata* which he was placing in the Society's collection.

Mr. Vredenberg exhibited a small egg, less in size than that of a sparrow, which had been found inside the egg of a domestic fowl.

Mr. K. G. Blair exhibited, on behalf of Mr. A. S. Hirst, living specimens of *Brachinus sclopeta* (Col.) recently collected by him in Corsica. Although it had shown its power of crepitation since received, it now seemed somewhat exhausted.

Mr. Rayward exhibited females of *Anaitis efformata* and *A. plagiata*, and stated that there seemed to be almost as much difference in this sex as in the males. In the former the body tapered off gradually, in the latter it was suddenly constricted at some distance from the anal end. The band across the forewing was straighter in the former species, but in the latter was somewhat elbowed. He showed microscopical preparations of the bodies of the two.

He reported that he was pleased to find that, after some years absence from the neighbourhood of Croydon, *Tiliacea citrago* was still to be found there. He had seen a number of the eggs of this moth on the lime twigs, and remarked on their resemblance to the leaf-scars.

Mr. A. E. Tonge exhibited, on behalf of Mr. H. Baker-Sly :—

1. *Sphinx ligustri*, male, with the usual pink markings on the body and on the hindwing replaced by cream. It was bred from a normal wild female taken in Cornwall.

2. *Sterrha sacraria*, male, taken at Lewes, August 11th, 1923, and in such fine condition as to suggest having been bred in this country. Mr. Sly is of opinion that the parent of his specimen must have crossed the Channel in 1922 as the Spring of 1923 was unfavourable; and such regular immigrants as *Colias croceus*, etc., were unable to get here.

Mr. N. D. Riley exhibited an example of race *salmacis*, the Eden Dene form of *Plebeius* (*Aricia*) *medon*. Owing to mining, road and rail cutting, etc., this picturesque and delightful resort will soon be a thing of the past.

Mr. G. T. Porritt communicated the following :—

Notes from Huddersfield.—The entomological season here has been awful: hardly anything to be done. The Tortrices especially seem to have been almost absent. I have not seen a dozen specimens of the genus *Tortrix* all told, and the species of *Cnephasia* (*Sciaphila*) have been just as scarce. *C.* (*S.*) *conspersana* has occurred in my garden, I think, every year up to this, some years in great profusion (breeding in the adjoining field), but not a single one have I seen this year. Even the usually very abundant *C.* (*S.*) *virgaureana* and *C.* (*S.*) *subjectana* have been all but absent.—G. T. Porritt (F.L.S., F.E.S.), Huddersfield.

Notes from St. Anne's.—Early in August I went to St. Anne's-on-Sea for a fortnight's rest and to recruit. I did no night work, but managed a bit of collecting in a leisurely way in the daytime. *Satyrus semele* was very abundant on the sandhills, more so I think than I have ever seen it in any of the numerous localities in which I have found it, both in England and Wales. It was even flying along the promenade, settling on the walls of the gardens, a thing I have never seen it do before, as its usual habit is to settle on the bare ground. An old newspaper someone had left on the sandhills, immediately opposite the hotel at which we were staying, was a great attraction to *S. semele*; for every specimen which came along seemed unable to pass it without settling upon it. A curious feature was that, so far as I remember, nearly all settled with their wings upright, and not sideways as they so often do when on the ground. It seems as if instinct taught them that they were better protected in such a position on the white paper. *Rumicia phlaeas* was also fairly common on the same ground. I looked them over for vars., but saw nothing except the most ordinary type. I found the old ground of *Apamea gueneéi* completely done up, being covered with a hard road, pleasure gardens, etc. Whether the species has been found anywhere else in the neighbourhood, I do not know.—Ibid.

Several Reports of Field Meetings were read.

JANUARY 24th, 1924.

ANNUAL MEETING.

The President in the Chair.

Owing to the Railway Strike the attendance was smaller than usual. The Council's Report (see page xiii), the Treasurer's Report (see page xvi), and the Balance Sheet (see page xviii), were received and adopted and the Annual Address was read by the President.

The President declared that the following members were elected Officers and Council for the ensuing year **1924-5** :—

President, N. D. Riley, F.Z.S., F.E.S. *Vice-Presidents*, E. J. Bunnet, M.A., F.E.S., and T. H. L. Grosvenor, F.E.S. *Treasurer*, A. E. Tonge, F.E.S. *Librarian*, A. W. Dods. *Curator*, S. R. Ashby, F.E.S. *Assistant Curator*, T. L. Barnett. *Hon. Editor of Proceedings*, H. J. Turner, F.E.S. *Hon. Secretaries*, Stanley Edwards, F.L.S., F.Z.S., F.E.S., and H. J. Turner, F.E.S. *Recorder of Attendances*, L. E. Dunster. *Hon. Lanternist*, A. W. Dennis. *Council*, H. W. Andrews, F.E.S., K. G. Blair, B.Sc., F.E.S., S. A. Blenkarn, F.E.S., A. A. W. Buckstone, F. B. Carr, E. A. Cockayne, M.D., F.E.S., A. W. Dennis, O. R. Goodman, F.E.S., and E.E. Syms, F.E.S.

Votes of thanks were passed to the Officers and Council, and to the President.

ORDINARY MEETING.

Messrs. Russel James and A. Russel James of Highgate, were elected members.

Mr. Jacobs exhibited a remarkably pale example of *Hybernia defoliaria* in which all marking was practically suppressed; taken in 1923.

Mr. Blenkarn exhibited a dwarf specimen of *Euchloris pustulata* (*bajularia*) taken some twenty-five years ago in the New Forest. It was not more than half the usual expanse.

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PAGE

Lepidoptera.

Corrigenda.

page 128, line 24. For *sphyrus* read *sephyrus*.
,, 68, ,, 38. ,, *Satyrus shakra* read *Pararge maera* race *shakra*.
,, 70, ,, 6. ,, *S. shakra* read *P. maera* race *shakra*.

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For 1886, 1887, 1888-9 (1 Vol.),
1890-91 (1 Vol.), 1892-3 (1 Vol.),
1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901,
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1905, price 2/6; 1906, price 2/6; 1907, price 2/6;
1908, price 2/6; 1909, price 5/-; 1910, price 4/6;
1911, price 4/6; 1912, price 4/-; 1913, price 4/-;
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1924-1925.

1924:—September 11th, 25th; October 9th, 23rd; November 13th, 27th; December 11th.

1925:—January 8th, 22nd; February 12th, 26th; March 12th, 26th; April 9th, 23rd; May 14th, 28th; June 11th, 25th; July 9th, 23rd; August 13th, 27th.

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Proceedings

OF

THE SOUTH LONDON

ENTOMOLOGICAL & NATURAL HISTORY

SOCIETY

1924-25

WITH EIGHT PLATES

AND TWO TEXT FIGURES.

PUBLISHED AT THE SOCIETY'S ROOMS

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1914-15. B. H. Smith, B.A., F.E.S.
1916-17. Hy. J. Turner, F.E.S.
1918-19. Stanley Edwards, F.L.S., etc.
1920-21. K. G. Blair, B.Sc., F.E.S.
1922 .. E. J. Bunnett, M.A., F.E.S.
1923-4.. N. D. Riley, F.Z.S., F.E.S.

LIST OF MEMBERS.

Chief subjects of Study :—*h*, Hymenoptera ; *o*, Orthoptera ; *he*, Hemiptera; *n*, Neuroptera ; *c*, Coleoptera ; *d*, Diptera ; *l*, Lepidoptera ; *ool*, Oology ; *orn*, Ornithology ; *r*, Reptilia ; *m*, Mollusca ; *cr*, Crustacea ; *b*, Botany ; *mi*, Microscopy ; *ec. ent.*, Economic Entomology ; *e*, signifies Exotic forms ; *trich*, Trichoptera.

YEAR OF ELECTION.

1920 ABBOT, S., 110, Inchmery Road, Catford, S.E. 6. *l.*

1886 ADKIN, B. W., F.E.S., "Trenoweth," Hope Park, Bromley, Kent. *l, orn.*

1922 ADKIN, J. H., *Council*, "Kirkside," Whitecliffe Road, Purley, Surrey. *l.*

1882 ADKIN, R., F.E.S., "Hodeslea," Meads, Eastbourne. *l.*

1901 ADKIN, R. A., "Hodeslea," Meads, Eastbourne. *m.*

1907 ANDREWS, H. W., F.E.S., *Council*, Woodside, Victoria Road, Eltham, S.E. 9. *d.*

1901 ARMSTRONG, Capt. R. R., B.A., B.C. (Cantab), M.R.C.S., F.R.C.P., 6, Castelnau Gardens, Barnes, S.W. 13. *e, l.*

1895 ASHBY, S. R., F.E.S., *Hon. Curator*, 37, Hide Road, Headstone, Harrow. *c, l.*

1924 ATKINSON, F., 4, Melrose Road, Wandsworth, S.E. 18.

1888 ATMORE, E. A., F.E.S., 48, High Street, King's Lynn, Norfolk. *l.*

1923 BAKER-SLY, H., "Eden Lodge," Westcott Road, Dorking. *l.*

1896 BARNETT, T. L., *Asst. Hon. Curator*, "The Lodge," Crohamhurst Place, Upper Selsdon Road, S. Croydon. *l.*

1887 BARREN, H. E., 78, Lyndhurst Road, Peckham, S.E. 15. *l.*

1921 BATES, John, 81, Birkbeck Mansions, Hornsey, N. 8. *l.*

1912 BATESON, Prof. W., M.A., F.R.S., F.L.S., F.E.S., "The Manor, House," Merton, Surrey. (*Hon. Member.*)

1922 BELL, W. H., 74, Sylvan Avenue, Wood Green, N. 22. *l.*

1924 BIRD, Miss F. E., 95, Lewin Road, Streatham, S.W. 16.

1911 BLAIR, K. G., B.SC., F.E.S., "Claremont," 120, Sunningfields Road, Hendon, N.W. 4. *n, c.*

1911 BLENKARN, S. A., F.E.S., *Council*, "Rannoch Lodge," 44, Grovelands Road, Purley. *l, c, odonata.*

YEAR OF ELECTION.

1898 BLISS, M. F., Capt., M.C., M.R.C.S., L.R.C.P., F.E.S., Butlin's Hill, Braunton, near Rugby. *l.*

1925 BLYTH, S. F. P., "Cleveland," Chislehurst, Kent. *l.*

1923 BOUCH, Baron J. A., "Springfield," S. Godstone, Surrey. *l.*

1923 BOWLES, L. G., 193, Brockley Rise, Honor Oak Park, S.E.23. *l.*

1909 BOWMAN, R. T., "Rockbourne," Keswick Road, Orpington, Kent. *l.*

1919 BOX, L. A., Lieut., F.E.S., 35, Gt. James Street, W.C.1. *h.*

1909 BRIGHT, P. M., F.E.S., "Colebrook Grange," 58, Christchurch Road, Bournemouth. *l.*

1921 BRISTOWE, W. S., "Ashford House," Cobham, Surrey. *spiders.*

1923 BROCKLEHURST, W. S., "Grove House," Bedford. *l.*

1924 BROOKE, Mrs. M. L., 48, Anerley Park, S.E.20. *l.*

1922 BRYANT, G. E., F.E.S., 163, Gloucester Terrace, W. 2. *col.*

1921 BUCKHURST, A. S., F.E.S., 9, Souldern Road, W. 14. *l.*

1909 BUCKSTONE, A. A. W., 307A, Kingston Road, West Wimbledon, S.W. 20. *l.*

1915 BUNNETT, E. J., M.A., F.E.S., *Council*, 19, "Silverdale," Sydenham, S.E. 26. *mi.*

1922 BURCH, W., 35, Ansdell Road, Peckham, S.E. 15. *l.*

1922 BUSHBY, L. C., F.E.S., 11, Park Grove, Bromley, Kent. *l.*

1922 CANDLER, H., "Broad Eaves," Ashtead, Surrey. *l.*

1886 CARPENTER, J. H., "Redcot," Belmont Road, Leatherhead, Surrey. *l.*

1899 CARR, F. B., *Council*, 46, Handen Road, Lee, S.E. 12. *l.*

1899 CARR, Rev. F. M. B., M.A., L.TH., The Vicarage, Alvanley, Nr. Helsby, Cheshire. *l, n.*

1872 CHAMPION, G. C., A.L.S., F.Z.S., F.E.S., Bromhill Road, Horsell, Woking. *c.* (*Hon. Member*).

1924 CHAPMAN, Miss E. F., "Betula," Reigate.

1924 CHAPMAN, Miss L. M., "Betula," Reigate.

1922 CHEESEMAN, C. J., 30, Clayton Road, Peckham, S.E. 15. *l.*

1879 CLODE, W. (*Life Member.*)

1915 COCKAYNE, E. A., M.A., M.D., F.R.C.P., F.E.S., *Vice-President*, 116, Westbourne Terrace, W. 2. *l.*

1920 COCKS, F. W., F.E.S., 42, Crown Street, Reading. *l.*

1899 COLTHRUP, C. W., 68, Dovercourt Road, E. Dulwich, S.E. 22. *l, ool, orn.*

1907 COOTE, F. D., 11, Pendle Road, Streatham, S.W. 16. *l, b.*

1919 COPPEARD, H., 12, King's Avenue, Greenford, Middlesex. *l.*

YEAR OF ELECTION.

1923 CORK, C. H., 11, Redesdale Street, Chelsea, S.W. 3. *l.*

1919 CORNISH, G. H., 141, Kirkham Street, Plumstead Common, S.E. 18. *l, c.*

1921 COTTAM, Major T. M. *l.*

1922 COUCHMAN, L. E., "Beechwood Lodge," West Heath Road, Hampstead, N.W. 3. *l.*

1909 COULSON, F. J., 17, Birdhurst Road, Colliers Wood, Merton, S.W. 19. *l.*

1918 COURT, T. H., F.R.G.S., "Willow Cottage, Market Rasen, Lincolnshire. *l.*

1902 COWHAM, F. W., 118, Minard Road, Catford, S.E. 6. *l.*

1924 COX, J. W., 4, Elm Court, Middle Temple, E.C.4. *l.*

1925 COX, R. Douglas, 12, Blakemore Road, Streatham, S.W. 16.

1911 COXHEAD, G. W., 45, Leicester Road, Wanstead, E. 11. (*Life Member.*) *c.*

1899 CRABTREE, B. H., F.E.S., "Holly Bank," Alderley Edge, Cheshire. *l.*

1918 CRAUFURD, Clifford, *Council*, 7, Summer Road, E. Molesey. *l.*

1920 CROCKER, Capt. W., "Rostellan," May Place Road, E. Bexley Heath. *l.*

1898 CROW, E. J., 70, Hepworth Road, Streatham High Road, S.W. 16. *l.*

1925 DANNATT, W., F.Z.S., "St. Lawrence," Gaibal Road, Burnt Ash, S.E. 12. *l.*

1888 DAWSON, W. G., F.E.S., "Shortlands House," Shortlands, Kent. (*Life Member.*) *l.*

1900 DAY, F. H., F.E.S., 26, Currock Terrace, Carlisle. *l, c.*

1889 DENNIS, A. W., *Hon. Lanternist*, *Council*, 56, Romney Buildings, Millbank, S.W.1. *l, mi, b.*

1912 DEXTER, S., 12, Stiles Way, Park Langley, Beckenham. *l.*

1918 DIXEY, F. A., M.A., M.D., F.R.S., F.E.S., Wadham College, Oxford. *Hon. Member.*

1901 DODS, A. W., *Hon. Librarian*, 88, Alkham Road, Stamford Hill, N. 16. *l.*

1921 DOLTON, H. L., 36, Chester Street, Oxford Road, Reading. *l.*

1912 DUNSTER, L. E., *Recorder of Attend.*, 44, St. John's Wood Terrace, N.W.3. *l.*

1886 EDWARDS, S., F.L.S., F.Z.S., F.E.S., *Hon. Secretary*, 15, St. Germans Place, Blackheath, S.E. 3. *l, el.*

Year of Election.

1923 Ellis, H. Willoughby, F.E.S., F.Z.S., F.L.S., M.B.O.U., 3, Lancaster Place, Belsize Park, N.W.3. *c, orn.*

1920 Enefer, F. W., "Burnham," 143, Westcombe Hill, Blackheath, S.E.3.

1915 Fagg, T. A., 55, Mt. Pleasant Road, Lewisham, S.E. 13. *l.*

1920 Farmer, J. B., 31, Crowhurst Road, Brixton, S.W. 9. *l.*

1918 Farquhar, L., 2, Darnley Road, Holland Park, W. 11. *l.*

1924 Fassnidge, Wm., M.A., 47, Tennyson Road, Portswood, Southampton. *l, n, trich, he.*

1923 Fawthrop, Rev. R. W., 71, Callcott Road, Brondesbury, N.W. 6. *l.*

1923 Fisher, R. C., B.SC., PH.D., Rothamstead, Exp. Stn., Harpenden.

1887 *Fletcher, W. H. B., M.A., F.E.S., Aldwick Manor, Bognor, Sussex. (*Life Member.*) *l.*

1889 Ford, A., "South View," 36, Irving Road, West Southbourne, Bournemouth, Hants. *l, c.*

1920 Ford, L. T., "St. Michael's," Park Hill, Bexley, Kent. *l.*

1915 Foster, T. B., "Lenore," 1, Morland Avenue, Addiscombe, Croydon. *l.*

1907 Fountaine, Miss M. E., F.E.S., 126, Lexham Gardens, W. 8. *l.*

1921 Frampton, Rev. E. E., M.A., Halstead Rectory, Sevenoaks, Kent. *l.*

1886 Fremlin, Major H. S., M.R.C.S., L.R.C.P., F.E.S., White House Farm, Bedmond, by King's Langley, Herts. *l.*

1919 Frisby, G. E., F.E.S., 29, Darnley Road, Gravesend. *hym.*

1912 Frohawk, F. W., M.B.O.U., F.E.S., c/o Dr. A. G. Butler, 124, Beckenham Road, Beckenham, Kent. *l, orn.*

1914 Fryer, J. C. F., F.E.S., "Chadsholme," Milton Road, Harpenden, Herts. *l, ec. ent.*

1911 Gahan, C. J., D.SC., M.A., F.E.S., British Museum (Natural History), South Kensington, S.W. 7. *c.*

1920 Gauntlett, H. L., F.E.S., M.R.C.S., L.R.C.P., "Van Buren," de Lisle Road, Bournemouth. *l.*

1920 Goodman, A. de B., 210, Goswell Road, E.C. 1. *l.*

1920 Goodman, O. R., F.Z.S., F.E.S. 210, Goswell Road, E.C.1, and and "Hatchgate," Massetts Road, Horley, Surrey. *l.*

1924 Grant, F. T., 37, Old Road West, Gravesend. *l.*

1925 Graves, P. P., F.E.S., 17, Mason Place, S.W. 7. *l.*

YEAR OF
ELECTION.

1923 GRAY, C. J. V., School House, "B," Bradfield College, Berks. *l.*

1908 GREEN, E. D., 17, Manor Park, Lee, S.E. 13. *l.*

1918 GREEN, E. E., F.E.S., "Ways End," Camberley, Surrey. *hem.*

1924 GREER, T., J.P., Curglasson, Stewartstown, Co. Tyrone. *l.*

1911 GROSVENOR, T. H. L., F.E.S., *President*, Springvale, Linkfield Lane, Redhill. *l.*

1884 HALL, T. W., F.E.S., 61, West Smithfield, E.C. 1. *l.*

1891 HAMM, A. H., F.E.S., 22, Southfields Road, Oxford. *l.*

1906 HAMMOND, L. F., "Letchmere," Olden Lane, Purley. *l.*

1903 HARE, E. J., F.E.S., 4, New Square, Lincoln's Inn, W.C. 2. *l.*

1911 HARRIS, P. F., 130, Harrow Road, W.2. *l.*

1924 HARWOOD, P., "St. Margarets," Selby Avenue, St. Albans. *l.*

1924 HAWKINS, C. N. H., 23, Dalebury Road. Upper Tooting, S.W.17.

1913 HAYNES, E. B., 82a, Lexham Gardens, W. 8. *l.*

1923 HAYWARD, Capt. K. J., F.E.S., Villa Ana, F.C.S.F., Argentine. *l.*

1920 HEMMING, A. F., F.Z.S., F.E.S., 25, Scarsdale Villas, W. 8. *l.*

1924 HENDERSON, J. L., 55, Wharfedale Gardens, Thornton Heath, S.E.25. *l.*

1922 HOBSON, A. D. *l.*

1920 HODGSON, S. B., 3, Bassett Road, N. Kensington, W. 10.

1919 HUMPHREYS, J. A., c/o Eastern Telegraph Co. Ltd., St. Louis, Mauritius. *l.*

1914 JACKSON, W. H., F.E.S., "Pengama," 14, Woodcote Valley Road, Purley. *l.*

1923 JACOBS, S. N. A., 5, Exbury Road, Catford Hill, S.E.6. *l.*

1924 JAMES, A. R., 7, Broadlands Road, Highgate, N.6. *l.*

1924 JAMES, R., F.E.S., 7, Broadlands Road, Highgate, N.6. *l.*

1922 JOBLING, Boris, 52, Charleville Road, W. Kensington, W. 14. *med. ent.*

1923 JOHNSTONE, J. F., "Barringtons," Rayleigh, Essex. *l.*

1918 JOHNSTONE, D. C., F.E.S., "Brooklands," Rayleigh, Essex. *l.*

1920 JOICEY, J. J., F.L.S., F.E.S., F.R.G.S., etc., "The Hill," Witley, Surrey. *l.*

1920 JUMP, A. C., 108, Trinity Road, Wandsworth Common, S.W.17.

1898 KAYE, W. J., F.E.S., "Caracas," Ditton Hill, Surbiton, Surrey. *l, S. American l.*

1900 KEMP, S. W., B.A., Indian Museum, Calcutta. *l, c.*

1910 KIDNER, A. R., "The Oaks," Station Road, Sidcup, Kent. *l.*

YEAR OF
ELECTION.

1925 KIMMINS, D. E., 16, Montrose Road, Penge, S.E. 20. *l.*

1924 LANGHAM, Sir Chas., Bart., F.E.S., Tempo Manor, Co. Fermanagh. *l.*

1922 LEECHMAN, C. B., "Bank House," Russell Hill Road, Purley, Surrey. *l.*

1914 LEEDS, H. A., 2, Pendcroft Road, Knebworth, Herts. *l.*

1925 LEFROY, Prof. Maxwell, F.E.S., Imperial College of Science, S. Kensington, S.W. 7. *ec, ent.*

1919 LEMAN, G. C., F.E.S., "Wynyard," 52, West Hill, Putney Heath, S.W. 15. *c.*

1919 LEMAN, G. B. C., F.E.S., "Wynyard," 52, West Hill, Putney Heath, S.W. 15. *c.*

1924 LEONHARDT, Hans, 45, Redcliffe Gardens, S.W. 10. *l.*

1922 LILES, Major C. E., 6, Hyde Park Mansions, N.W. 1. *l.*

1920 LINDEMAN, F., c/o Rio de Janeiro Tramway Light and Power Co., Caixa Postal 571, Rio de Janeiro, Brazil. *l.*

1924 LISTER, J. J., M.A., F.R.S., F.E.S., "Merton House," Grantchester, Cambridge. *l.*

1922 LOCK, A. K. (Miss), F.Z.S., 77, Grove Hill Road, Denmark Park, S.E. 5. *l.*

1924 LOWTHER, A., "The Old Quarry," Ashtead, Surrey.

1896 LUCAS, W. J., B.A., F.E.S., 28, Knight's Park, Kingston-on-Thames. *Brit. o., odonata, n, m, b.*

1921 LYLE, G. T., F.E.S., "Briarfield," Stump Cross, Shibden, Halifax. *h.*

1892 MAIN, H., B.SC., F.E.S., F.Z.S., "Almondale," 55, Buckingham Road, S. Woodford, E. 18. *l, nat. phot., col.*

1922 MANN, F. G., B.SC., A.I.C., Chemical Laboratories, Pembroke Street, Cambridge. *l.*

1889 MANSBRIDGE, W., F.E.S., "Dunraven," Church Rd., Wavertree, Liverpool. *l, c., etc.*

1922 MAPLES, Major S., "Monkswood," Huntingdon. *l.*

1916 MASON, G. W., 99, Seaford Road, Ealing, W.5. *l.*

1922 MASSEE, A. M., "Park Place," The Common, Sevenoaks, Kent. *l.*

1922 MEECH, E., 119, Kempton Road, East Ham, E. 6. *l.*

1885 MERA, A. W., 5, Park Villas, Loughton, Essex. *l.*

1881 MILES, W. H., F.E.S., "Grosvenor House," Calcutta. Post Box 126. *mi, b.*

YEAR OF
ELECTION.

1889 MOORE, H., F.E.S., 12, Lower Road, Rotherhithe, S.E.16. *l, h, d, e l, e h, e d, mi.*

1910 MORFORD, D. R., 16, Spencer Road, Cottenham Park, Wimbledon, S.W. 20. *l.*

1911 MORICE, The Rev. F. D., M.A., F.E.S., "Brunswick," Mt. Hermon, Woking. (*Life Member.*) *h.*

1920 MORRELL, H. A., "Heathdene," Wordsworth Rd., Wallington, Surrey. *l.*

1923 MUNROE, J. W., D.SC., F.E.S., "Green Lawn," Kew Road, Richmond, Surrey.

1923 MUTCH, J. P., "Mayfield House," Church Road, Bexley Heath. *l.*

1923 NASH, T. A. M., 16, Queen's Road, Richmond, Surrey. *l.*

1923 NASH, W. G., F.R.C.S., "Clavering House," de Pary's Avenue, Bedford. *l.*

1906 NEWMAN, L. W., F.E.S., Salisbury Road, Bexley, Kent. *l.*

1918 NIMMY, E. W., F.E.S., 15, George Street, Mansion House, E.C. 4. *l.*

1911 PAGE, H. E., F.E.S., "Bertrose," 17, Gellatly Road, New Cross, S.E. 14. *l.*

1923 PARKER, F. A., 205, Lauderdale Mansions, Maida Vale, W.9. *l.*

1915 PEARSON, G. B., Coconut Grove, P. O., nr. Miami, Florida, U.S.A. *l.*

1908 PENNINGTON, F., Oxford Mansions, Oxford Circus, W. 1. *l.*

1887 PORRITT, G. T., F.L.S., F.E.S., "Elm Lea," Dalton, Huddersfield. *l, n.*

1912 POULTON, PROF. E. B., D.SC., M.A., F.R.S., F.L.S., F.G.S., F.Z.S., F.E.S., "Wykeham House," Oxford. (*Hon. Member.*)

1897 PREST, E. E. B., 1 and 2, Chiswell Street, E.C. 1. *l.*

1919 PRESTON, N. C., Harper Adams Agricultural College, Newport, Salop. *l, ec, ent.*

1924 PRIEST, C. G., 30, Princes Place, Notting Hill, W.11. *l.*

1904 PRISKE, R. A. R., F.E.S., 9, Melbourne Avenue, W. Ealing, W. 5. *l, m.*

1919 QUILTER, H. J., "Fir Cottage," Kiln Road, Prestwood, Great Missenden. *l, c, d, mi.*

1922 RAIT-SMITH, W., F.E.S., "Birkby House," Bickley Park, Kent. *l.*

Year of Election.

1925 Ralfs, Miss E. M., "Greenfield," Warwick Road, Redhill, Surrey.

1922 Rattray, Col. R. H., 68, Dry Hill Park Road, Tonbridge, Kent. *l.*

1902 Rayward, A. L., F.E.S., 1, "Meadhurst," Meads Road, Eastbourne. *l.*

1887 Rice, D. J., 8, Grove Mansions, North Side, Clapham Common, S.W. 4. *orn.*

1920 Richardson, A. W., F.E.S., 28, Avenue Road, Southall, Middlesex. *l.*

1908 Riley, Capt. N. D., F.E.S., F.Z.S., *Vice-President*, 5, Brook Gardens, Beverley Road, Barnes, S.W. 13. *l.*

1919 Roberts, J. G., 1, Segary Villas, Hadley Road, New Barnet.

1910 Robertson, G. S., M.D., "Bronllys," 72, Thurlow Park Road, Dulwich, S.E. 21. *l.*

1922 Robertson, W. J., M.R.C.S., L.R.C.P., F.Z.S., 69, Bedford Road, S.W. 4. *l.*

1911 Robinson, Lady Maud, F.E.S., "Worksop Manor," Notts. *l, n.*

1920 Rothschild, The Right Hon. Lord, D.SC., F.R.S., F.L.S., F.Z.S., F.E.S., Tring, Herts. *l.* (*Life Member.*)

1887 Routledge, G. B., F.E.S., "Tarn Lodge," Heads Nook, Carlisle. *l, c.*

1890 Rowntree, J. H., "Scalby Nabs," Scarborough, Yorks. *l.*

1921 Ruggles, Hy., 146a, Southfield Road, Bedford Park, W. 4.

1915 Russell, S. G. C., F.E.S., "Roedean," The Avenue, Andover Junction, Hants. *l.*

1908 StAubyn, Capt. J. S., "Sayescourt Hotel," 2, Inverness Terrace, Bayswater, W. 2.

1914 Schmassmann, W., F.E.S., "Beulah Lodge," London Road, Enfield, N. *l.*

1910 Scorer, A. G., "Hillcrest," Chilworth, Guildford. *l.*

1922 Seabrook, Lieut. J. C., F.E.S., 8, West Warwick Place, Belgravia, S.W. 1. *l.*

1923 Sevastopulo, D. G., c/o Ralli Bros., Karachi. *l.*

1910 Sheldon, W. G., F.Z.S., F.E.S., "West Watch," Limpsfield, Surrey. *l.*

1898 Sich, Alf., F.E.S., "Corney House," Chiswick, W. 4. *l.*

1920 Simms, H. M., B.SC., F.E.S., "The Farlands," Stourbridge.

1903 Smallman, R. S., F.E.S., "Hethersett," 30, Leigham Court Road, Streatham, S.W.16. *l, c.*

Year of Election.

1921 Smart, Major, H. D., r.a.m.c., m.d., d.sc., f.e.s., 172, High Road, Solway Hill, Woodford Green. *l.*

1908 Smith, B. H,, b.a., f.e.s., "Frant Court," Frant, nr. Tunbridge Wells. *l.*

1922 Seth-Smith, D. W. *l.*

1925 Simmons, A., 42, Loughboro Road, W. Brideford, Nottingham. *l.*

1920 Smith, S. Gordon, f.e.s., f.l.s., "Estyn," Boughton, Chester. *l.*

1890 Smith, William, "Hollybank," 76, Oakshaw Street, Paisley. *l.*

1882 South, R., f.e.s., 4, Mapesbury Court, Shoot-up-Hill, Brondesbury, N.W.2. *l, c.*

1908 Sperring, C. W., 8, Eastcombe Avenue, Charlton, S.E. 7. *l.*

1920 Stafford, A. E., 98, Cowley Road, Mortlake, S.W. 14.

1872 Step, E., f.l.s., *Council*, 158, Dora Road, Wimbledon Park, S.W. 19. *b, m, cr; Insects, all Orders.*

1916 Stewart, H. M., m.a., m.d., 123, Thurloe Pk. Rd., Dulwich, S.E. 21. *l.*

1922 Stokes, C. H. H., 107, Queen's Road, Upper Norwood, S.E. 19. *ent. bot.*

1923 Stolzle, G. A. W., 15, Benson Road, Forest Hill, S.E. 23. *l.*

1923 Stolzle, R. W., 15, Benson Road, Forest Hill, S.E. 23. *c.*

1910 Stoneham, Capt. H. F., f.e.s., m.b.o.u., Charangani, Trans-Nzoia, Kenya Colony, Brit. E. Africa. *l.*

1924 Storey, W. H., 31, Burton Street, W.C. 1. *l.*

1911 Stowell, E. A. C., b.a., Eggars Grammar School, Alton, Hants.

1916 Syms, E. E., f.e.s., 22, Woodlands Avenue, Wanstead, E.11. *l.*

1920 Talbot, G., f.e.s., "The Hill Museum," Witley. *l.*

1922 Tams, W. H. T., f.e.s., 19, Sulivan Road, Hurlingham, S.W. 6. *l.*

1894 Tarbat, Rev. J. E., m.a., The Vicarage, Fareham, Hants. *l, ool.*

1913 Tatchell, L., f.e.s., Swanage, Dorset. *l.*

1925 Taylor, J. S., 24, Winchester Avenue, Brondesbury, N.W.6. *l.*

1902 Tonge, A. E., f.e.s., *Hon. Treasurer*, "Aincroft," Grammar School Hill, Reigate. *l.*

1887 Turner, H. J., f.e.s., *Hon. Editor*, 98, Drakefell Road, New Cross, S.E. 14. *l, c, n, he, b.*

1924 Valentine, A., "Misterton," Talbot Hill, Bournemouth. *l.*

1921 Vernon, J. A., "Lynmouth," Reigate, Surrey. *l.*

1921 Vesterling, A. W., 107, Castle Street, Battersea, S.W. 11. *l.*

1923 Vredenberg, G., 38, Ashworth Mansions, Maida Vale, W.9. *l.*

YEAR OF
ELECTION.

1889 WAINWRIGHT, C. J., F.E.S., "Daylesford," Handsworth Wood, Birmingham. *l*, *d*.

1911 WAKELY, L. D., 11, Crescent Road, Wimbledon Common, S.W. 19. *l*.

1880 WALKER, Comm. J. J., M.A., F.L.S., F.E.S., "Aorangi," Lonsdale Road, Summertown, Oxford. *l*, *c*.

1925 WARD, J. Davis, "Limehurst," Grange-over-Sands. *l*.

1920 WATSON, D., "Stewart House," 27, Overcliffe, Gravesend.

1922 WATSON, E. B., F.E.S., Entomological Branch, Dept. of Agriculture, Ottawa, Ontario, Canada. *l*.

1925 WATTS, L. W., 3, Holbrook Lane, Chislehurst. *l*.

1911 WELLS, H. O., "Inchiquin," Lynwood Avenue, Epsom. *l*.

1922 WEST, A. G., 198, Clive Road, West Dulwich, S.E. 21. *l*.

1911 WHEELER, The Rev. G., M.A., F.Z.S., F.E.S., "Ellesmere," Gratwicke Road, Worthing. *l*.

1920 WIGHTMAN, A. J., 35, Talbot Terrace, Lewes, Sussex. *l*.

1914 WILLIAMS, B. S., "St. Genny's," Kingscroft Road, Harpenden. *l*, *c*, *hem*.

1912 WILLIAMS, C. B., M.A., F.E.S., Ministry of Agriculture, Cairo, Egypt. *l*, *ec. ent*.

1923 WINDSOR, F. S., "Oatlands Cottage," Horley, Surrey. *l*.

1923 WINDSOR, P. H., "Fern Hill," Horley, Surrey. *l*.

1920 WITHYCOMBE, C. L., M.SC., F.E.S., West Indian Agricultural College, Trinidad, B.W.I. *l*, *b*, *n*, *mi*, *ec*, *ent*.

1918 WOOD, H., "Albert Villa," Kennington, near Ashford, Kent. *l*.

1921 WORSLEY-WOOD, H., *Council*, 31, Agate Road, Hammersmith, W. 6. *l*.

1920 YOUNG, G. W., F.R.M.S., 20, Grange Road, Barnes, S.W. 13.

Members will greatly oblige by informing the Hon. Sec. of any errors in, additions to, or alterations required in the above Addresses and descriptions.

REPORT OF THE COUNCIL, 1924.

THE Council, in presenting the fifty-third Annual Report, is pleased to state that the Society is in a satisfactory condition. The membership is now 239, the highest record in its history, and is made up as follows:—Full Members 198, Country 31, Life 6, Honorary 4.

The Council regrets to report the deaths of two Members, W. E. Butler and W. West.

There have been four resignations.

A successful Exhibition of Orders other than Lepidoptera was held on September 25th.

Of the long series of Annual Exhibitions that have been held, that which took place on November 27th was one of the best, and more than 150 members and their friends were present.

Mr. Dennis has again officiated as Hon. Lanternist.

Papers have been read before the Society by R. Adkin (two), H. W. Andrews (two), Dr. Baylis, W. Hales, W. J. Lucas, Capt. J. Ramsbottom, W. H. T. Tams, and H. J. Turner, and comprise the following subjects:—One on General Natural History, one on Entomological Natural History, Vermes 1, Lepidoptera 2, Diptera 2, Neuroptera 1, Botany 1. Lantern slides were shown on several of these occasions, and three evenings were arranged for the Exhibition of Lantern Slides.

To the Photographic Album, Major Liles has given his portrait; but the Council would like to have photographs of all members. Mr. Goodman presented several photographic groups for placing in the Society's Albums. Mr. R. Adkin presented the Society with a reading stand fitted with electric light. Mr. J. H. Adkin provided electric fittings for the Society's lantern.

The Honorary Curator reports that further numerous additions were made to the Society's Collections during the past year. British Lepidoptera from Messrs. R. Adkin, A. A. W. Buckstone, and the Rev. C. R. N. Burrows (per H. J. Turner).

Mr. H. W. Andrews made a useful addition to our Diptera Collection of 105 species of the Families *Empidae* and *Anthomyiidae*, and also a pair of the very rare Asilid *Eutolmus rufibarbis*.

The Council on behalf of the Society, beg to thank all the above mentioned donors.

The Honorary Librarian reports that the Library has been well made use of, considering the difficulties the members have had in obtaining books, during the progress of the structural alterations of the rooms.

Successful Field Meetings were held at Chalfont Road, Alderstead Heath, Lewes (whole day), Westerham and Mickleham (Fungus Foray); but a meeting at Horsley was spoilt by very wet weather.

Mr. R. Adkin was the Society's Delegate at the meeting of the Representatives of the Corresponding Societies of the British Association at Wembley.

Messrs. Stanley Edwards and H. J. Turner were the Society's Delegates at the Congress of the South-Eastern Union of Scientific Societies held at Guildford in May.

The volume of Proceedings published late in the year, consists of xix. and 153 pages with one plate, and a favourable Review of the Proceedings appeared in the "Field" for November 6th.

The following is a list of the additions to the Library during the year, by exchange unless otherwise stated.

Books.—"Birds Beneficial to Agriculture," Frohawk (B.M.); "Nat. Hist. of Wicken Fen" (R.A.); "Marine Turbellarians from the Phillipines" (U.S. Mus.); "Foraminifera of the Atlantic Ocean" (U.S.M.); "East African Mammals" (U.S. Mus.); "Marine Fishes of Panama" (U.S. Mus.).

Magazines.—"Entomologist"; "Philippine Journal of Science"; "Entomologiska Tidskrift"; "Entomologische Mitteillungen"; "Vasculum"; "Bull. Soc. Ent. de France"; "Entomological News"; "Zoologiska Bidraga"; "Essex Naturalist"; "Irish Naturalist"; "Canadian Entomologist."

Reports.—British Association; Entomological Society of Hampshire; Hastings and E. Sussex Nat. Hist. Society; Mosquito Investigation Committee; U.S. National Museum; Catalogue of the U.S. Herbarium; Annales de Soc. ent. de France; Bulletin of the Hill Museum; London Naturalist; Proceedings of the Bournemouth Nat. Science Socy.; Transactions of the Leicester Literary and Scientific Society; Proceedings of the I. of Wight Nat. Hist. Society: Proceedings of the Entomological Society of Brit. Columbia; Transactions of the Entomological Society of London (Dr. F.); Bolletino R. Scuola d'Agricultura, Portici, Italy; Ann. Report of the Smithsonian Institute.

Pamphlets.—"Guides to Geology and Mollusca" (B.M.); "Rambler's Handbook"; "List of Papers Published on N. Science in 1923" (B.Ass.); "Bulletin of the S.E. Union"; "Address 1924, Entomological Society"; "Peronea hastiana" (W. Sheldon); "Le Volvox" (Janet); Separata from Field Mus. of Chicago; ditto from Prof. T. D. A. Cockerell; from the U.S. Nat. Museum.

TREASURER'S REPORT, 1924.

Ever since you paid me the compliment of electing me your treasurer, now over five years ago, I have looked forward most anxiously to the time when I should find myself able to report that the Society was self supporting, and that its regular annual income was sufficient to meet its regular annual expenditure.

So far this happy position has not been reached, and I have had to call upon our many kind friends and well wishers for donations to the Publication Fund in order to make both ends meet.

This year I am very pleased to be able to say that a marked advance in the direction of the attainment of my desires has been made. 1924 was a particularly fortunate year for the Society's finances. Not only was there an increase in the membership at an advanced rate of subscription, but the legacy left to us by our late member, Mr. Lachlan Gibb, amounting to £200, was paid with interest just before the end of the year, and will shortly be invested for the benefit of the Society.

In addition to this the Misses Chapman, who I am glad to say have both become members, wishing to perpetuate the memory of their brother, the late Dr. T. A. Chapman, F.R.S., gave us a most handsome donation amounting to £300, expressly stipulating that this sum should be invested and the annual income from it devoted to the cost of publishing the Society's Proceedings.

Further, the sale of the cabinets, storeboxes, duplicate books, etc., bequeathed to the Society by the late Mr. W. J. Ashdown, which has been going on since 1921, has now been completed, and the total sum realised therefrom amounts to just over £70.

These sums have been, or very shortly will be, invested for the benefit of the Society, which is now possessed of a capital amounting to not less than £650, and bringing us in an annual income of £32 10s.

Our membership as it stands to-day should produce a further sum of £130 in annual subscriptions, making together a regular annual income of £162 10s., a figure which is within £5 of what I may regard as our average regular annual expenditure.

What is wanted now is a further increase in our membership, and a determined effort on the part of those existing members, of whom I regret to say there are far too many, who are in arrears with their subscriptions, to bring their payments up to date and to keep them there.

The advanced subscription has just about sufficed for the object it was intended to meet, namely, the increase of £25 per annum in the rent of our rooms; our subscription income for 1924 showing an increase over that for 1923 of exactly £24 12s. 6d.

The Balance Sheet for 1924 shows that we have now an excess of assets over liabilities amounting to £694 7s. 6d., a very marked improvement on the figures shown in the last balance sheet.

I desire to thank the officers and Council of the Society for their help and encouragement during the past twelve months, and also those members who have contributed so liberally to the donations list. Last but not least, let me say a word in praise of those who have paid up promptly, or signed an order to their bankers for the payment of their subscriptions automatically, thus saving me a large amount of really unnecessary work.

The accounts in detail, which have been carefully checked and passed as correct by the auditors, Messrs. T. W. Hall and F. B. Carr, are as follows:—

THE SOUTH LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.

STATEMENT OF ACCOUNTS FOR THE YEAR 1924.

REVENUE ACCOUNT.

Expenditure.		£ s. d.
To Rent ..	50 0 0	
,, Fire Insurance	1 6 6	
,, Lantern	1 10 6	
,, Attendance ..	2 10 0	
,, Hire of chairs	2 14 0	
		58 1 0
South-Eastern Union of S. Societies	15 0	
Footpaths Preservation Society ..	10 6	
		1 5 6
,, Postages, Stationery & sundries :—		
Secretaries	10 0 6	
Treasurer ..	16 3	
		10 16 9
,, Entrance fees to Suspense a/c		2 5 0
,, Vote to Publication Fund ..		43 0 0
,, Vote to Library Fund		5 0 0
,, Balance		34 10 6
		£154 18 9

Income.		£ s. d.
By Balance brought forward		20 8 3
,, Subscriptions :—		
Current ..	90 1 0	
Advance ..	17 0 6	
Arrears ..	8 5 0	
		115 6 6
,, Entrance fees		2 5 0
,, Dividends ..		5 15 0
,, Interest on Legacy		11 4 0
		£154 18 9

ENTRANCE FEES AND LIFE-MEMBERSHIP COMPOSITION ACCOUNT.

	£ s. d.
To Purchase of £300 5% War Loan, 1929/47, at $101\frac{5}{16}$, and 21s. costs	304 19 9
£30 5% Natl. War. Bond, Feb. 29, P.O. and Costs ..	32 4 10
,, Balance	212 3 2
	£549 7 9

	£ s. d.
By Credit Balance brought forward ..	36 17 3
,, Gift from the Misses Chapman in memory of their brother, the late Dr. T. A. Chapman ..	300 0 0
,, Legacy under will of the late W. Lachlan Gibb	200 0 0
,, Sale of Books and Cases of Ashdown Bequest ..	10 5 6
,, Entrance fees	2 5 0
	£549 7 9

LIBRARY FUND.

		£ s. d.
To Binding		5 3 4
,, Postages	1 3	
,, Curtains	16 8	
,, Sundries	13 0	
,, Caretaker	2 6	
		1 13 5
,, Balance		5 11
		£7 2 8

	£ s. d.
By Balance	2 1 10
,, Fines	10
,, Vote from General Fund	5 0 0
	£7 2 8

PUBLICATION FUND.

		£ s. d.
To Cost of Blocks	16 6	
,, Printing Proceedings	89 17 0	
		90 13 6
,, Balance		13 4
		£91 6 10

		£ s. d.
By Balance		1 15 0
,, Donations	28 4 6	
,, Dividends	15 0 0	
		43 4 6
,, Sales of Duplicate Proceedings		3 7 4
,, Vote from General Fund		43 0 0
		£91 6 10

BALANCE SHEET.

Liabilities.	£ s. d.
To Balance, being excess of assets over liabilities	694 7 6
	£694 7 6

Assets.		£ s. d.
By Balances—		
,, General Fund	34 10 6	
,, Ent. Fee and Life Comp. a/c	212 3 2	
,, Library Fund	5 11	
,, Publication Fund	13 4	
		247 12 11
,, Investments at Cost:—		
£130 of 5% National War Bonds	131 14 10	
£300 5% War Loan	304 19 9	
		436 14 7
,, Subscriptions outstanding:—		
Good 10		
Doubtful 20		10 0 0
		£694 7 6

Audited and found correct, this 19*th January*, 1925.

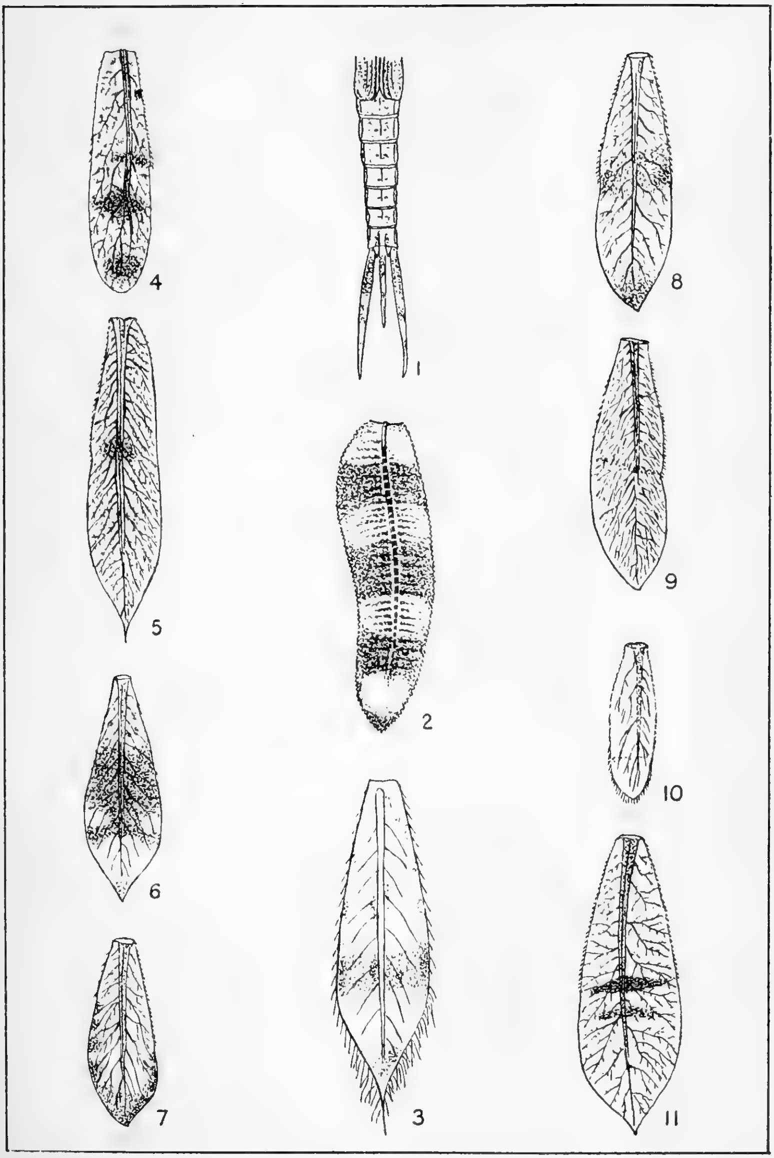
T. W. HALL,
F. B. CARR, } *Auditors.*

Explanation of Plate I.

Caudal lamellae of :—

1. *Calopteryx splendens*, Harr. (×3).
2. *Lestes sponsa*, Hans. (×7).
3. *Platycnemis pennipes*, Pall. (×10).
4. *Erythromma naias*, Hans. (×7).
5. *Ischnura elegans*, Lind. (×10).
6. *Pyrrhosoma nymphula*, Sulz. (×10).
7. *Pyrrhosoma tenellum*, Vill. (×10).
8. *Agrion pulchellum*, Lind. (×10).
9. *Agrion puella*, Linn. (×10).
10. *Agrion mercuriale*, Charp. (×10).
11. *Enallagma cyathigerum*, Charp (×10).

(All slightly diagrammatic.)



W. J. Lucas, del.

Caudal Lamellae of the Naiads of the British Zygopterid Dragonflies.

By W. J. Lucas, B.A., F.E.S.—*Read February 28th*, 1924.

It will probably be unnecessary to remind my hearers that the natural order of insects, Paraneuroptera or Odonata, is divided into two suborders, Anisoptera and Zygoptera, the one having fore- and hindwings different in shape if not also in size, the other having those appendages practically alike. One or two intermediate insects should perhaps constitute another suborder; but this does not concern us just now, as there are no British examples of them. Concommittant with this difference in the matter of the wings, on which the names of the suborders are based, there are other important differences also, shewing that we are dealing with two clear-cut groups of insects. One very striking difference is found in the appearance and function of the anal appendages. With these, as regards the Zygoptera, I am dealing shortly in this paper.

British Paraneuroptera contain the following families:—

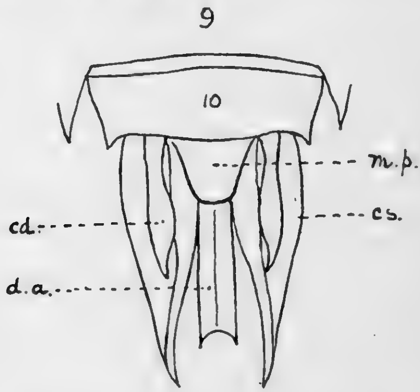
Anisoptera.

Aeschnidae containing	*Gomphinae.*
	Cordulegasterinae.
	Aeschninae.
Libellulidae containing	*Corduliinae.*
	Libellulinae.

Zygoptera.

Calopterygidae containing	*Calopteryginae.*
Lestidae	*Lestinae.*
Agrionidae	*Platycneminae.*
	Agrioninae.

Before passing on to the Zygoptera it will be convenient to look for a moment at the anal appendages of an Anisopterid dragonfly. In the freshly hatched naiad there appear to be usually (but perhaps not in all dragonflies) three only—the *dorsal appendage* and the two *cerci*. These, in both sexes, constitute the true naiad appendages. In the Aeschnids (at any rate), about the fourth or fifth instar, another pair begins to put in an appearance, above the cerci on each side of the dorsal appendage. These have been named *cercoids.* In the imago the cercoids become the two superior appendages of the male and the only two appendages of the female. These two newly developed appendages are not original naiad structures, but are being developed simply for use in the imaginal stage. In the male Anisopterid naiad there is developed at (or from) the base of the dorsal appendage, a projection (it looks like a swelling only in some cases). This is the *male projection*, which is destined to become the third—viz., *inferior appendage*—of the male imago; it is not present in the female. So the male projection is a means of detecting the sex of an Anisopterid naiad, provided that the example is not so young that the projection has not had time to shew itself. Since those mentioned are the only imaginal appendages it is clear that at the metamorphosis the cerci and the dorsal appendage disappear. There is one difference in connection with the Zygopterids, that in the male the cerci remain and become in the imago the *inferior appendages.* This is considered to be the interpretation of the appendages in both conditions of a dragonfly's life.



Anal appendages of an Anisopterid Dragonfly.
(Anax imperator Leach)

m.p. = male projection. cs = circus.
d.a = dorsal appendage. cd = circoid.

Now to turn to the Zygopterids. Here again we have five appendages; but the two cerci and the dorsal appendage have, in general, become lamellae, while the two cercoids are quite small. In the newly hatched naiad the lamellae are longer in proportion to the length of the body than in the fully grown one. In the first stage they are slender and tubular (perhaps slightly triangular in cross-section), and taper to the distal extremity, where they terminate in a long slender hair.* The pointed structures of the first stage become triangular in section at an early subsequent instar, and at length, flattening out, become lamellar.

British Zygopterid dragonflies are the following :—

Calopteryx	*virgo*, Linn.
,,	*splendens*, Harris.
Lestes	*dryas*, Kirby.
,,	*sponsa*, Hans.
Platycnemis	*pennipes*, Pall.
Erythromma	*naias*, Hans.
Pyrrhosoma	*nymphula*, Sulz.
,,	*tenellum*, Vill.
Ischnura	*pumilio*, Charp.
,,	*elegans*, Lind.
Agrion	*pulchellum*, Lind.
,,	*puella*, Linn.
,,	*hastulatum*, Charp.
,,	*mercuriale*, Charp.
,,	*armatum*, Charp.
Enallagma	*cyathigerum*, Charp.

Frequently the mid lamella is slightly different in shape from the lateral ones, as might of course be expected, seeing that they are not homologous structures. This is strikingly so in the case of our two species of *Calopteryx*. In other instances it may be only a little broader, somewhat curved, and more blunt at the tip; perhaps in some cases there may be no difference at all. The lamella may be quite simple, or may be constricted so as to form two distinct segments. We have in Britain examples of the simple, but not of the much constricted form. There is, however, a distinct nodal line in many instances, in which case the basal part may be thicker and the margin strongly armed with spines, while the apical part is thin with margin plain, or at any rate less well armed, or sometimes hairy. The distal segment may be absent by obliteration of the nodal line, or in consequence of the segment beyond the node disappearing, in each case producing a simple lamella.† As we examine the species belonging to our fauna one by one we shall see that there are a number of important variations in the lamellae of even our sixteen native Zygopterid dragonflies.

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* Perhaps these statements may turn out to be a little too general, seeing that few naiads have been examined.

† In some non-British forms saccoid appendages are produced by inflation of the original triangular form.

Calopteryx virgo and **C. splendens.**—In both species the lamellae are totally unlike those of any other British dragonfly, but in general bear a close resemblance one to the another. The two lateral "lamellae" retain the early form, triangular in transverse section, the mid lamella alone having become leaf-like. At this we are not surprised, for *Calopteryx* is an archaic genus. In both species the lamellae are dark-banded and finely serrated at the edges. In *C. splendens* there may be normally two bands, and in *C. virgo* three; but the chief difference seems to be that in the former species the mid lamella is much shorter than the lateral ones, while in the latter all three are nearly equal. The appendages are capable of being closed together, so as to appear like a continuation of the abdomen tapering to a point, which arrangement no doubt adds materially to the already wonderfully cryptic resemblance of the naiad to a bit of decaying water-weed. (Plt. I. fig. 1.)

Lestes dryas and **L. sponsa.**—Owing to the scarcity of the former species with us, and perhaps to other reasons also, I have not seen its naiad; but, judging from the very close resemblance of the imagines, the naiads should turn out to be much alike also. The long lamellae (some 10mm.) of *L. sponsa* are of the simple type, without node or constriction. They appear to be easily separable into two layers. The tip is but very slightly pointed (a little more so in the middle one). They are broadest near the base, then the lateral ones are nearly straight, with parallel margins, while the middle one is a trifle broader and curved downwards towards the tip. The margins all round are armed with short spines. There seem to be no visible tracheae. In colour they much resemble thin laminae of tortoiseshell, the dark blotches being arranged more or less in three bands, which are much stronger in some examples than in others. Dark transverse striations are an interesting feature of these lamellae. (Plt. I. fig. 2.)

Platycnemis pennipes.—Again the simple lamella is long for the insect (about 7·5mm.). The shape is lanceolate, broadest in the apical third. The margin bears slender hairs, increasing in length towards the tip, which terminates in a long fine point. All the lamellae are lightly spotted, and shew the mid tracheae with lateral branches rather few in number. (Plt. I. fig. 3.)

Erythromma naias.—With this species we reach the subfamily Agrioninae, in which all the lamellae of all the naiads I have seen have a nodal line dividing them into two more or less distinct parts. Each lamella contains two adjacent longitudinal tracheae which bear branches, sometimes producing a very beautiful pattern, especially when seen under the microscope. In *E. naias* this pattern is the most beautiful of all found in our naiads. Its lamellae are some 8mm. long, and of fairly uniform width—about 2mm. The tip is rounded, and each lamella is distinctly divided into two parts by a nodal line. The basal half has the margin toothed, especially on one edge, where there is a pronounced nodal nick, preceded by a few strong teeth. The apical half of the lamella has a fringe of extremely fine hairs, and bears three brown transverse bands as well as a longitudinal one, along the stout tracheae. The branch tracheae have their branches conspicuously dark in colour and arborescent in structure. (Plt. I. fig. 4.)

Pyrrhosoma nymphula.—In this species we have a rather broad lamella for its length of 5·5mm. The margin is not strongly armed, and the nodal point does not shew up distinctly. The tip ends in a long sharp point. The strong longitudinal tracheae have a number of long branches, with but few secondary branches. The surface is mottled with brown and spotted with still darker brown. (Plt. I. fig. 6.)

Pyrrhosoma tenellum.—Again we have a broad and short lamella, the length being only 3·8mm. for a maximum breadth of 1·5mm. The nodal point is fairly clear, and between it and the base of the lamella are a number of marginal spines; there are a few also on the opposite margin near the base. The tip is not by any means so strongly pointed as in its congener. Brown blotches around the margin adorn the surface in the apical half. The median tracheae are pronounced, and they have a fair number of branches, these last being branched also to some extent. (Plt. I. fig. 7.)

Ischnura pumilio.—This naiad I have not seen. Roster describes it and gives diagrammatic figures in "Bulletin Società Entomologica Italiano," Vol. XVIII. Apparently it may be distinguished from the next species by the more blunt tip to the lamellae, which have spines on one margin only.

Ischnura elegans.—In shape the lamella of this species is rather narrowly lanceolate with a long point at the tip. The length is 6·5mm., and width 1·25mm. Both nodal line and notch are clear, and the margin is thickly spined between node and base on one side, while there are a few spines at the base of the opposite margin. Where they are not spined the margins are fringed with fine hairs.* The strongly coloured longitudinal tracheae have numerous dark branches and sub-branches. (Plt. I. fig. 5.)

Agrion pulchellum.—In length this lamella is about 5mm., while its breadth is about 1·5mm. In shape it is rather broadly lanceolate, tapering to the base, and somewhat bluntly pointed at the tip. The clearly shewn node is near the middle, and the basal half of the lamella is spined on each edge—more strongly on the dorsal one. The apical half is plain, being apparently even without hairs. It is traversed by stout median tracheae, whose branches and sub-branches fairly well cover the surface. There is a rather darker

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* Not all species have been examined microscopically for these fine hairs; but apparently they mean little.

colour about the nodal line [and perhaps also near the tip]. In the example drawn there was an extra longitudinal trachea near the ventral margin. (Plt. I. fig. 8.)

Agrion puella.—As in the last species we have a lamella about 5mm. in length, and about 1·5mm. broad. The colouring is very uniform. In shape it is rather broadly lanceolate with a clear nodal notch and line near the middle; it is spined on each side basally from the nodal line, and apparently quite plain, even hairless, distally. The tip is more blunt than in *A. pulchellum*, which lamella, however, it very closely resembles. In the one drawn, that of a female, there were strong longitudinal tracheae, with numerous branches and sub-branches. Those of a male were much less full of tracheae, and even more closely resembled those of *A. pulchellum*. (Plt. I. fig. 9.)

Agrion hastulatum.—This naiad I have not seen, and I believe it has not been described. Its lamellae will probably resemble those of *A. puella*.

Agrion mercuriale.—This is one of the smallest of our dragonflies, and the lamellae of its naiad are certainly the smallest of all, being even less in size than those of *P. tenellum*. The length is 3⅓mm., and the breadth less than 1mm. It is lanceolate in shape, the tip being somewhat bluntly pointed. The node and faint nodal line are only about two-fifths of the length of the lamella from the tip. On one margin there are a number of spines gradually changing (not at the node) into long slender hairs as the tip is approached. Similar spines and hairs, rather less pronounced, are found on the opposite margin. The tracheal branches are rather few. Characteristic points are the small size and bluntly pointed tip. (Plt. I. fig. 10.)

Agrion armatum.—This naiad again I have not seen, but judging from Rousseau's figure the lamellae closely resemble those of *A. puella*.

Enallagma cyathigerum.—In this naiad the lamellae are 5·5mm. long. They are broadly lanceolate and sharp pointed. The tracheae are much branched and conspicuous. There is a clear nodal line, in a dark area, taking the form of a band. Usually a parallel dark line is found near it on the apical side. The margins are spined between the nodal line and base of the lamella, hairy on the distal side of the line. (Plt. I. fig. 11.)

There remains now to say a few words with regard to the use of these caudal lamellae. As they usually contain two easily seen tracheae with numerous branches, it seems reasonable to conclude that they are employed as breathing organs. Probably this is the case, but it is not wise to jump at conclusions, for this can scarcely yet be said to have been proved. For this reason I have preferred to call these appendages caudal lamellae rather than caudal gills.

That naiads do not breathe entirely by means of their lamellae is obvious, for they often lose them and yet live quite well and ultimately produce imagines. Here I might mention that if a lamella is lost in an early stage it is gradually renewed, being seen first as a small tubular process, in cross-section somewhat circular. I possess one or two such examples with partly renewed lamellae. If sufficient time remains before emergence is due a new lamella may become fully developed. To remedy a defect of this kind there may be a slight amount of rectal breathing, as in the Anisoptera, and in fact *Calopteryx* seems to have an imperfect rectal respiratory system. *Their* "lamellae" certainly do not look like efficient gills! Probably, however, when lamellae are lost respiration is carried on entirely (or nearly so) through the skin, as with worms and others of the lower animals.

Whatever may be the case with regard to breathing, of one thing we are certain—that the naiads use their lamellae very adroitly for purposes of locomotion. Pressing their legs against the body, they sway the abdomen from side to side, and use the lamellae much as a boatman does an oar at the stern of a small boat. In this way Agrionine naiads, at any rate, are able to proceed through the water at a fairly good pace. When the lamellae are gone they move by swaying the abdomen, and clearly find locomotion not so easy a matter.

Some phases of Parallel Variation in the British Lepidoptera.

By Robert Adkin, F.E.S.—*Read March 13th*, 1924.

Variation in the Lepidoptera I take to imply a divergence from the recognised type of the same species. It may be a question of colour—most red species have yellow forms, and many species have melanic forms. Or it may be an alteration of pattern—an increase or decrease in the normal number of spots in spotted species, or the lengthening or uniting of spots into bars; the suppression of some usual marking or its alteration in shape, and so forth—this all implies variation. Then again variation may take the form of local races—the specimens in some particular locality, although alike among themselves, differ in some material respects from the recognised type; or it may be that some particular form of variation runs through a whole group of nearly allied species, irrespective of locality, and that what occurs as an occasional variation in many districts is the prevailing form in some others.

It is to this latter phase of variation that I propose to confine my attention, and in illustration to use some of the commoner British species, although I may occasionally have to wander farther afield.

In passing, it may not be amiss to glance at the construction of the lepidopterous wing. The wing of a butterfly or a moth consists of an upper and a lower cuticle or membrane, the two being held together by numerous columns, and between the membranes pass the nervures. The membranes, as a rule, are practically colourless; but attached to their outer surfaces are the scales, arranged much in the manner of tiles upon a roof. The scales may be described as minute, transparent, flattened sacs, filled with pigment, and it is to the arrangement of the differently coloured scales that the pattern of the wing is due. In all normal specimens of a given species the arrangement of the groups of the variously coloured scales will be the same, thus producing the same pattern in each; but if the size of a group of one coloured scales is increased at the expense of another, or, indeed, if there is any departure from the normal grouping of the scales, we at once get what is called a "variety."

Pieris rapae may be regarded as a very constant species. Its normal markings in the female, consist of two black spots and a black tip on the white forewings; but it has a recurrent, although rather rare form in which the two spots are connected by a black

Explanation of Plate II.

1. *Pieris rapae* ♀ var.

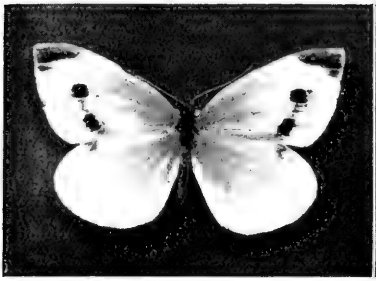
2. ,, *napi* ♀ var.

3. ,, *brassicae* ♂ var. resembling race *cheiranthi* ♂.

4. ,, ,, race *cheiranthi* ♂.

5. ,, ,, ♀ var. approaching race *cheiranthi* ♀.

6. ,, ,, race *cheiranthi* ♀.



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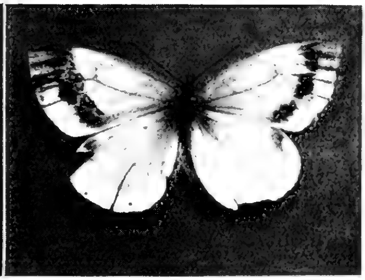

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Photo. A. W. Dennis.

Explanation of Plate III.

1. *Dryas paphia* ♀.

2. *Argynnis aglaia* ♀.

   Forms showing a similar phase of variation in the elongation of the submarginal spots.

3. *Aglais urticae.*

4. *Pyrameis atalanta.*

5. *Vanessa io.*

6. *Pyrameis cardui.*

   Forms showing a similar phase of variation in the darkening of the costa.

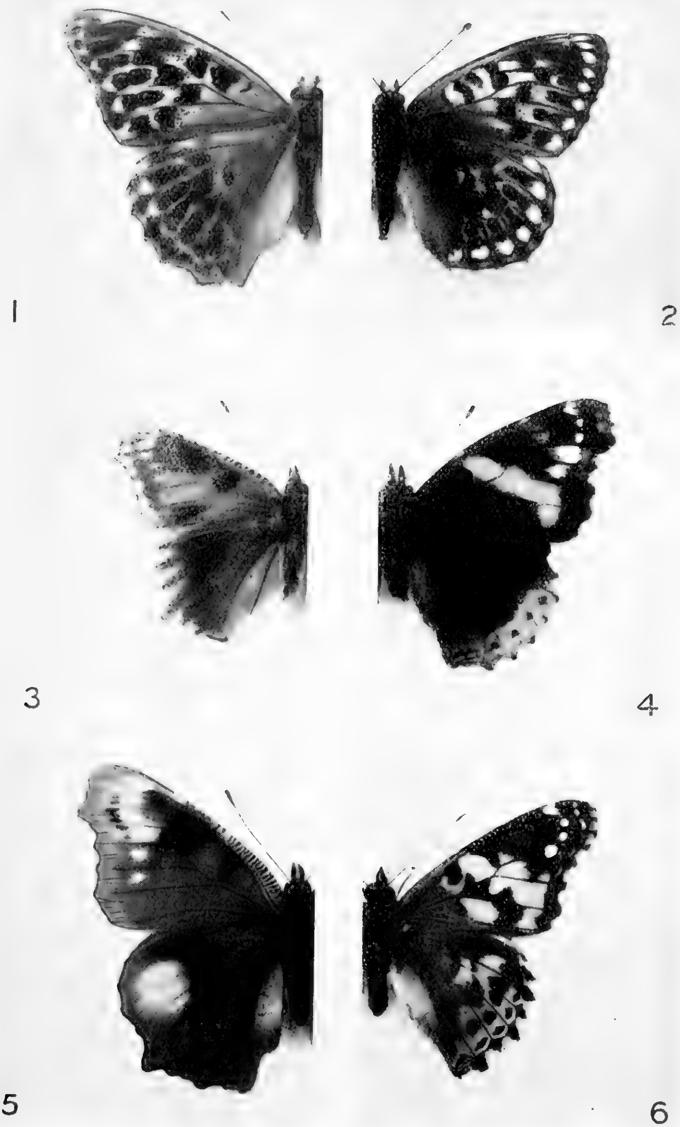

Photo. A. W. Dennis.

Explanation of Plate IV.

1. *Zygaena filipendulae.*
2. ,, *lonicerae.*
3. ,, *trifolii.*
4. ,, *filipendulae* 5 spotted var.
5. ,, ,, var. resembling *Z. achilleae.*
6. ,, *achilleae.*
7. ,, *filipendulae* } vars. resembling *Z. purpuralis.*
8. ,, *lonicerae* }
9. ,, *trifolii* }
10. ,, *purpuralis.*

PLATE IV.

Photo. A. W. Dennis.

shade. In its near relative, *P. napi*, this varietal character is of rather more frequent occurrence and somewhat more emphasised, the black connecting shade being stronger, and in extreme examples reaching to the black tip of the wing, thus making the two spots and the tip into a complete band. In *P. brassicae*, another nearly allied species, we also occasionally find specimens with the two spots strongly united, and in this species we have been able to prove that this form is, to some extent, hereditary. Thus we have three nearly allied species all showing a similar form of variation. The male of the last mentioned species normally has no marking on the wings except the black tips, but we occasionally find a specimen in which there is a little elongated patch of black scales on the disc: this form also is more or less hereditary. Now it is a remarkable fact that these forms that occur in Britain as unusual varieties, are in the island of Madeira the prevailing, and in the Canary Islands practically the only form; the male having the little elongated patch of black scales exactly as in our variety, while in the female the spots and the tip are all connected, forming a complete, blurred, black band, much as we have seen in the extreme form of *P. napi*. The Canary Islands form is known as *P. brassicae* var. *cheiranthi*. It was given that name by Hübner, in the belief that in it he had obtained a species distinct from our *P. brassicae*; there is, however, now little doubt as to it being a form of that species.

Our three large Argynnids have a common scheme of decoration, black markings on a tawny ground, and all have a submarginal row of large, round black spots on all the wings. A form of variation common to them all is for these round spots to become elongated into short rods. In *A. cydippe* this form is rarely found, but it has been taken more than once. In *A. aglaia* it is met with not infrequently. While in *Dryas paphia*, a species apparently more prone to variation than the other two, it, or some modification of it, is the most frequent form of variation that we find. Not that variation of any sort is really common with any of them, but when it does occur it more frequently takes this phase than any other.

The commoner Vanessids are, as a rule, little given to variation in the pattern of their markings, yet, even in them, there is a phase that seems to be common to them all, namely, the linking up of the black costal markings.

In *Aglais urticae* these markings take the form of three irregular quadrate spots and, again and again, specimens have occurred in which these spots have run together, thus making a large costal blotch. *Urticae* is the commonest of our Vanessids, and it is probably for that reason that we find more specimens of this form occurring in it than in the other species. *Polygonia c-album*, which has similar costal markings, has an exactly similar variety ("Seitz," I., pl. 63e.), it is, however, with us a somewhat local species, and consequently the variety is less frequently met with, but it has been known to occur occasionally.

In *Pyrameis atalanta* the costal markings take the form of a black blotch cut into by a white, quadrate spot, and the corresponding variety occurs by the obliteration of this white spot ("Mosley's Drawings," *Vanessa*, pl. 7), thus leaving a continuous black blotch as in the *urticae* variety. So with *Vanessa io*, the costal blotch is cut up by a wedge-shaped pale mark and the eye-spot, and it is the obliteration of the former and the blurring of the eye-spots that give the corresponding variety. In *Pyrameis cardui* the costal markings are like those of *P. atalanta*, the variety being similarly produced by the obliteration of the white marks ("Mosley's Drawings," *Vanessa*, pl. 8. "Entom.," VI., p. 345).

Two nearly allied genera are each represented in this country by a single species. *Limenitis sibilla* is a velvety black species and *Apatura iris* a dark brown one with, in the male, a beautiful purple sheen, and each has a broad, irregular white band extending across the wings. A phase of variation common to them both is for this white band to become obliterated by the ground colour.

Now, all these varieties of Argynnids, etc., that I have referred to are recurrent forms under natural conditions, but they have also been repeatedly produced artificially. A good deal of work has been done in what are termed "temperature experiments." That is by exposing the pupae to extremes of heat or cold greater than those normally prevailing; in the latter case even to the extent of requisitioning the cold storage chamber for the purpose. And not only have these same varieties of the species already referred to been produced over and over again, but corresponding varieties in other allied species have also been obtained by this means.

Thus *Eugonia polychloros*, a fairly common species in this country, has costal markings practically the same as *Aglais urticae*, but it is a very constant species, and if it has a corresponding variety in nature, it is so rare that it has not come under my notice, yet it is easily produced artificially, as is also the similar form in another closely allied species, *E. xanthomelas*, which, however, does not occur with us.

Another group where we find a parallel phase of variation extending to practically all our species, is the Lycaenids, and here it is the spotting of the undersides that is affected. These are, in the main, of some shade of grey, the chief decoration being numerous black spots, and it is the elongation, or joining up of two or more of these spots, that constitutes the form of variation to which I refer.

Lycaenopsis (*Cyaniris*) *argiolus* is, as regards its spotting, one of the most constant species, yet, even here, we find not infrequently, that the two little spots at the anal angle of the hindwings are joined, thus forming a short, curved streak. In *Cupido minimus* we find a similar happening. In *Plebeius aegon* (*argus*), and indeed in all the following species, the joining together of two or more spots on the costal margin of the hindwings, or on the inner margin of the forewings, is a frequent form of variation. *Polyommatus icarus* furnishes various combinations of such union of spots, so in *Agriades thetis* (*bellargus*) we find them still further intensified, and in *A. coridon*, which seems of all our species the most prone to this form of variation, the joining up of spots is so complete as to produce a radiated rather than a spotted insect.

So far we have taken all our examples from the butterflies, but there are also two small groups of moths that I would refer to, that appear to me to give even more striking illustration of this phase of variation than any that we have yet seen.

The Zygaenids, as we know them in this country, are a group of practically black insects with bright red markings; we have to deal only with their forewings. Our commonest species, *Z. filipendulae*, has six spots, placed, two elongate at the base, two round in the centre, and two round near the outer margin of the wings, the sixth being the outermost of them all. Two other species, *Z. lonicerae* and *Z. trifolii*, have five spots, placed in just the same positions as in *Z. filipendulae*, but the outer, sixth spot of that species, is missing in them. Occasionally one meets with a specimen of *Z. filipendulae* in which this sixth outer spot is not developed, so that we then have a variety of *Z. filipendulae* that exactly resembles *Z. lonicerae*.

Z. filipendulae also has a frequently recurrent variety, in which the upper of the two basal spots is elongated and the outer spots united, such specimens having a strong superficial resemblance to another species that occurs, with us, only in a very restricted locality in Scotland—*Z. achilleae*

Again, all three of our common species, *Z. filipendulae*, *Z. lonicerae*, and *Z. trifolii*, have varieties in which two or more of the spots become united and, in extreme cases, the whole six or five spots, as the case may be, become joined up into one large, red blotch, extending over the greater portion of the wing. In such cases they not only bear a strong resemblance to each other, but also to another species—*Z. purpuralis* (*pilosellae*), which is known to occur in this country, only over very small areas on the Scottish, Welsh, and Irish coasts.

Z. meliloti, a somewhat smaller, five-spotted species that occurs in the New Forest, has varieties that follow closely those of our other five and six-spotted species in regard to the coalescence of their spots, leaving us with one only of the seven species known to occur in Britain, *Z. exulans*, that does not, so far as we know, fall into that phase of variation.

Another compact group is represented by four of the species that we now include in the genus *Diacrisia*, namely, *D. lubricipeda*, *D. lutea*, *D. urticae*, and *D. mendica*. They are all spotted species, and liable to a good deal of variation in the arrangement of their spots, but each appears to have some fairly constant feature in that arrangement. Thus, *D. lutea*, a buff-coloured species, normally has a row of black spots running from near the centre of the inner margin diagonally across the wing and terminating at the tip. But it also has a variety in which this row of spots, instead of running diagonally right across the wings, is bent near its middle, so that it terminates on the costa at about two-thirds of its distance from the base, thus forming a sort of question mark. *D. lubricipeda*, a white species, has its spots scattered over its wings without any very set pattern, except that near the apex some of them fall into a short diagonal line, thus representing the terminal portion of the row that crosses the *lutea* wing. In some specimens, however, the spots about the central portion of the wing are gathered up, as it were, into a very good representation of the "question mark" that we have noted in the variety of *D. lutea*. *D. mendica* is, at least as regards its female, for normally its male is smoky-brown, another white species, and in its normal form, very sparsely spotted with black dots. I have recently reared a large number of specimens of a mongrel race—*mistura*. ("Proc. Sth. Ldn. E. N. H. Soc.," 1922-3, p. 55.) Among them, but only in the second mongrel generation, are a few that show clear indications of a marking similar to the "question mark" already noticed in the two other species showing this peculiarity.

D. urticae is an even more sparsely spotted white species, in its normal form seldom having more than two or three little black dots on its wings. Yet a form occurs not infrequently, in which a short row of black spots occurs near the apex of the wing, which exactly corresponds with the short diagonal line that we have already referred to as the one fixed character in the spotting of the *D. lubricipeda* wing.

Another form of variation common to at least three of the species, is for the spots to become elongated, until, in extreme forms they appear as long black radiate streaks. This may be well followed in a series of specimens of *D. mendica*. At first we see one or two spots near the base of the wings assuming an elongate appearance, then some of them become short, longitudinal marks, and finally we have several black streaks instead of spots. So in *D. lubricipeda*, where in extreme forms, the wing is practically covered with radiated black streaks; and in *D. lutea* this form of variation reaches its climax, in a practically black insect with pale wing-rays. Thus we see that four species, abundantly distinct in their normal forms, have each varietal forms which closely resemble the normal form of one or more of the others.

Then again, although three of the species have radiated forms, in two of them they occur only occasionally, and so far as we have ascertained do not appear to be capable of reproduction on any large scale, whereas in the case of the third species, *D. lutea*, the radiated form, when bred from is not only reproduced in the offspring, but in continued breeding from selected parents actually becomes intensified, and further, when a crossing between a normal form and a radiated one are bred from, the radiated tendency strongly persists in the offspring.

In seeking the interpretation of these varied forms one is too apt to regard them as superficial. We have already considered the construction of the wing and have found that the scales, which show us the pattern, are external, lightly attached appendages to the wing surface, but in the course of their development they were not always so. Our knowledge of the development of the scales is not complete, but such information as we have goes to show that the formation of the scales of the wing commences apparently soon after the casting of the final larval skin; that is, practically, from the time that the larva turns to pupa. The scales are formed by special cells of the hypodermis that are placed deeper in the wing than the other hypodermal cells. Each scale is formed by one cell, and protrudes through the overlying hypodermis; the membrane into which the scales are inserted is a subsequently developed structure, and the beautiful articulation of the scale with the wing takes place by a division of the stalk of the scale, where it is encompassed by the membrane. The pigmentation of the scales takes place at a much later period, probably only just before the emergence from the pupa. The colours appear to be of the nature of urates, probably stored up during the larval life, but on this part of the scale development we still need much information. It is known, however, that the scales when first formed are pallid, and that while they are in this condition the hypodermis is either pigmented or in close contact with pigmentary matter, and that as the scales become coloured this pigmentation of the hypodermis diminishes, so that it is clear that the colour of the scales is obtained from matter in the interior of the developing wing, and probably by the agency of the hypodermis. We may therefore regard the wing pattern formed by these scales as the manifestation, the visible record as it were, of the exceedingly complex development that has been taking place throughout the creature's existence.

As to how the various functions that cause variation are brought into play, as to how they act on the cells that produce the scales, or as to the distribution of the various pigments to the scales, we have little information; but we do know that certain external stimuli applied during the early stages of the creature's life, such as abnormal climatic conditions, undue heat, cold, or moisture, or even unnatural food continued over many generations, are liable to induce variation in the imago.

I fear that it may appear that I have digressed somewhat from my subject, but it is as perhaps well, that in considering the variation of the imago, we should have in mind some knowledge of what has taken place during the time occupied in the development of the creature while passing through its immature stages. But to resume.

We have noticed that in each group that we have looked at, some particular form of variation has been common to the various species included in it. In the Pierids it was the joining up of the spots; in the Argynnids the spots lengthened out into rods; in the Vanessids the blurring and closing up of the dark costal markings, and so forth. Then in the Zygaenids there is the resemblance of the variety of one species to the type of another, and in the Diacrisias the adoption by several species of a common form of variation, or the assumption of the typical markings of one species by the variety of another. And it must be remembered that these are not isolated cases, it is not only an individual that we find with the peculiarity. Some of the forms, it is true, may be but rarely met with, but others are of frequent occurrence, and all may be regarded as recurrent forms. What, then, is the interpretation?

The generally accepted view appears to be that this class of variation arises as a reversion to some former type, and if that be so, it strengthens the suggestion that each group has arisen from some common ancestor. It may be asked, what evidence have we? and I confess little more than the opinion of those who have made a close study of the creatures with which we are concerned, in conjunction with other forms of nature. Geology helps us little; of insect remains, it is true, there are plenty to be found even in the older formations right back to the Devonian, but they are all of orders with hard, chitinous exteriors, beetles, crickets, cockroaches, and so forth; the delicate, scale-winged butterflies and moths, when they are found, as they occasionally have been in the more recent formations, are mere skeletons, giving little clue to their original wing markings. But experiment carried on over long periods, with many forms and in many ways, comes to our aid and brings out facts on which opinions may be founded; but beyond this I fear there is little to build. Complicated as such experiments are, and often difficult of interpretation, apparently trivial matters brought out by them often have their significance. The appearance of the question mark in the mongrel race of *D. mendica* may be a case in point. It is possible that the act of mongrelisation may have brought out some latent character, and if so, appears to support the close affinity of the members of this group to their common ancestry.

Again, it has been asserted with some degree of confidence, based upon long continued research, that our primitive butterflies and moths were dull coloured creatures, and that the bright colours we now see were evolved at a later period. If this be so it offers an explanation of some of the forms of variation that we have been considering. It will be noticed that in some of the Vanessid examples, the darkening of the costa, which was a feature common to the group, was accompanied in most of them by a general loss of brightness. This was particularly noticeable in the specimens of *Aglais urticae*, where the costal blotching was accompanied by a darkening of the hindwings and an almost complete absence of the blue marginal markings and other bright colouring of the wings; in the blurring of the colour in *V. io*; and in the specimens of *P. atalanta*.

So far, we have regarded the phase of variation that we are considering, only in the light of a reversion, and have seen that as such it appears to offer an explanation of many cases of parallel variation. But a butterfly or a moth is, as the glance that we have had at the structure and development of its wings alone has shown, a very complicated organism, and, as such, an individual may have stored up in it many diverse characters, some may be receding, dying out; others dominating, progressive. We also know that these characters may be brought out by the action of certain external stimuli. Let us then again return to our examples.

In the Pierids we find that the joining up of the spots of the female wing is a character common to all three of our species, and as such we regard it as a reversion. But we also find that in one of the species this character has been greatly exaggerated, not as a variation, but as the prevailing form in a restricted locality, in fact a local race, and that its male also has a prevalent character that is found elsewhere only as a rare variety. Of course I am alluding to the form of *P. brassicae* that is found in Madeira and the Canaries; islands right out in the ocean, and with their own peculiar climate. The inference is that this species also possessed some dominating element, which the stimulus of the particular climate was able to bring into action, and the race being isolated, ultimately became the prevailing one of the locality.

The radiated form of *D. lutea* is, as we have already seen, another example of a dominating form, and although it has apparently not attained to the status of an exclusive local race anywhere, possibly on account of frequent intercourse with the normal form, its continued occurrence in a restricted locality—Heligoland and the adjacent low lying German coast—suggest that this character may also be regarded as progressive.

The whole subject is, I am fully aware, a controversial one, and I feel that I have been able to treat it only very superficially; but I trust that I have said enough to give cause for thought and possibly criticism, which I need hardly add will be welcome. It is by the discussion of such subjects from all points of view that we are likely to arrive at a correct understanding of them.

The Romance of Helminthology.

By H. A. Baylis, M.A., D.Sc., Department of Zoology, British Museum (Natural History).—*Read April 24th*, 1924.

Probably to most people Helminthology, or the study of parasitic worms, seems anything but a romantic subject. To some it even appears a disgusting pursuit. It has, however, its romantic side, as I shall attempt to show, The romantic element resides in the wonderful life-histories that have been unfolded to us, mostly in comparatively recent years, and the transformations and migrations undergone by some of these seemingly lowly organisms in the course of their obscure lives. Some of these stories are as fascinating as fairy tales, and they furnish many illustrations of the adage that "truth is stranger than fiction." I propose to tell some of them quite simply, and let them speak for themselves. Examples will be taken from among the Trematodes or Flukes, the Cestodes or Tapeworms, and the Nematodes or Roundworms.

Let us take first the Trematodes. There is every reason to believe that all the Trematodes, found as internal parasites of vertebrate animals, pass a certain period of their life-history in invertebrates. In fact, we may say with almost complete confidence that all those of terrestrial vertebrates go through a phase in which they are parasites of some mollusc. As an example, let us recapitulate the well-known life-history of the liver-fluke of the sheep (*Fasciola hepatica*). As an adult this worm inhabits the bile-ducts in the liver of sheep, cattle, goats, antelopes and other ruminants, and it is occasionally found in various other animals, including the pig, kangaroo, and man. The eggs laid by the mature worms find their way down the intestine and are passed out into the open. If they fall into a suitably moist situation they hatch after a short interval. At one pole of the egg there is a lid or cap, which opens to let the embryo escape. This embryo is a little creature called a *miracidium*, and is covered with a coat of cilia, or vibratile hairs, by means of which it can swim forward. It has a pair of pigment-spots for eyes, and a sort of snout at the front end. Everything now depends, for the miracidium, upon its meeting with a particular kind of pond-snail. If it does not meet the right one, it cannot continue to live long. When it comes in contact with a *Limnaea truncatula* (in Europe, as far as we know, this is the only snail that will do), it proceeds to bore through its skin and other tissues by means of its snout, until it reaches an organ to its liking, such as the liver. Here it loses its coat of cilia and grows into a comparatively large, irregular, sac-like body called a *sporocyst.* Inside this there are formed, by a process of budding, numbers of other bodies called *rediae.* These have a sort of sucker at one end, and a pair of blunt appendages on the sides towards the other. By a similar process of internal budding, each redia may give rise either to a further generation of rediae or to the next stage, called the *cercaria.* The cercaria is a little tadpole-like thing with a roundish body, two eye-spots, two suckers and a long tail. The cercariae finally burst their way out through the tissues of the snail into the water of some pond, ditch, or puddle. They swim actively about like tadpoles by means of their tails, and when one reaches a blade of grass, a sprig of watercress, or other suitable object, it wriggles up it and comes to rest. Now it loses its tail, secretes round itself a protective envelope or "cyst," and waits patiently till a suitable animal, such as a browsing sheep, swallows it. Then the cyst is dissolved, and the young fluke penetrates through the wall of the intestine into the body-cavity, where it wanders about for a few days until it reaches the liver. It pierces the external capsule of the liver and burrows in, and so eventually reaches its destination, one of the bile-ducts, where it grows to maturity, lays eggs, and so completes the life-cycle.

We have seen that the young *Fasciola* simply waits on a blade of grass in the hope of being swallowed by its final host. This, of course, means that a very large number of eggs have to be produced, in order that a few of the larvae may find hosts and perpetuate their species. As a matter of fact, it is well known that nearly all parasitic worms do produce enormous numbers of eggs, and various ways and means have been adopted by them to insure a large output. We need not go into these here, but I may just mention that it has been calculated that a single female of the hook-worm, *Necator americanus*, lays about 9,000 eggs a day. Every ripe segment of the tapeworm, *Taenia solium*, is said to contain about 53,000 eggs. As some 800 such segments may be produced by one worm in the course of a year, it is calculated that one worm produces over 42,000,000 eggs per annum. In the case of another tapeworm, *Diphyllobothrium latum*, the annual output has been estimated at 64,000,000. To return, however, to our Trematodes, *Fasciola*, as I said, waits passively to be swallowed. But other Trematodes do not leave so much to chance. The cercariae of the Schistosomes, or blood-flukes, for example, adopt the methods of the miracidium, and, seeking out their host, burrow into it through the skin. Thus in Egypt and other countries it is unwise to bathe in pools inhabited by the snails which these worms (commonly, but incorrectly, called *Bilharzia*) use as their intermediate hosts. It is of interest, perhaps, to notice in passing that the blood-flukes are almost the only known

Trematodes in which the sexes are separate. In most Trematodes each worm is hermaphrodite, *i.e.*, it carries in itself all the necessary apparatus to function either as a male or as a female. But in the Schistosome family the male and female are distinct, and the male is much broader and stouter than the female, which it clasps and carries about in a groove in its body.

Some Trematodes make use of a second intermediate host which may, by design or accident, be eaten by the final host. Thus the lung-fluke, *Paragonimus*, is said to pass its early stages, up to the cercaria, in a mollusc, *Melania*, and then to invade certain fresh-water crabs and crayfishes, in which it forms a cyst, and is sometimes swallowed by man. Similarly, *Clonorchis*, a parasite of man, dog, cat and pig, is believed to live first in a snail, *Bythinia*, and secondly in various fishes.

Before leaving the Trematodes, one very strange example is worth mentioning. This is a species called *Leucochloridium macrostomum*. The peculiar tree-like sporocyst of this worm is found in a certain small snail, *Succinea putris*, and sends out branches, some of which always extend into the head of the snail and into the inside of its eye-bearing tentacles. These branches are brightly coloured, green or yellow and red, and moreover have the power of rhythmic pulsation. The whole head of the snail, therefore, with the colours showing through the stretched skin, and the movements form an object particularly likely to attract the attention of birds, and may even be mistaken by them for a group of caterpillars or grubs. The result is that the cercariae contained in the sporocyst find themselves being taken into the beak of the right kind of host, such as a robin, hedge-sparrow or warbler, much more often than they would if they depended merely upon chance. Moreover, the same snail may serve to infect several birds, for a branch of the sporocyst may burst through the skin and be pecked off, or the tentacle, with its portion of the sporocyst, may be pecked off, and after a few days or weeks another will grow in its place. And even this is not all, for it seems that the presence of the sporocyst upsets the snail's vision, so that it exposes itself in conspicuous places much more than normal snails do, and thus its chances of being found by a bird are still better. The cercariae, if swallowed by an old bird, are said to be digested, but if the parent bird gives them to its nestlings, they withstand the action of the digestive fluids and so survive.

We will now pass on to consider some of the Tapeworms. The common text-book example of a tapeworm life-history, that of *Taenia solium*, is well known. However, as it will stand for a large number of similar cases, we may briefly run through it. *Taenia solium* is found, in the adult stage, only in man. It lives in the intestine, and attaches itself, by means of the suckers and hooks on its so-called "head," or scolex, to the mucous membrane. A little way behind the head begins the long chain of segments, new ones being continually formed in the "neck" region, and pushing the older ones back. As they pass backwards the segments gradually become mature, each containing a complete set of male and female organs. Towards the posterior end we find segments in which the uterus, crammed with eggs, occupies with its branches almost all the space, the other organs having now practically disappeared. The last segment is constantly becoming loose and being passed out of the host's body. When this happens the segment still has certain powers of muscular contraction and is even capable of creeping feebly about. Eventually, however, it begins to disintegrate, and its thousands of eggs get scattered over whatever surface it has been lying upon, or in the water if it has fallen there. Now these eggs, in the case of *Taenia*, have a very thick, hard, inner shell, and can withstand dryness and other adverse conditions for some time. Should a pig happen to swallow them, the shells are dissolved, and the little embryos are set free in the pig's intestine. Each embryo is a little roundish creature armed with six relatively powerful hooks arranged in pairs around one end. Using these hooks as levers, it elbows its way in between the cells of the pig's tissues, piercing the intestinal wall and wandering about until it reaches a comfortable position, usually among the muscles. Here it absorbs nourishment through its skin, and grows into a little bladder about the size of a pea. While this is going on a depression appears at the pole opposite to the original embryonic hooks, and gradually deepens into a tubular invagination within the bladder, so that the animal is now something like the turned-in foot of a sock, though of course there is no opening to represent the leg. At the bottom of the invagination, or toe of the sock, five thickenings now begin to appear, and of these the one at the extreme end develops into the kind of proboscis called the *rostellum*, which is soon provided with a double crown of strong hooks, and the other four become muscular suckers.

At this stage the animal is called a *cysticercus*. It has now completed its development as far as it can go in the intermediate host. If it remains there too long, it becomes calcified and dies. But if the muscle containing it is swallowed, imperfectly cooked, by a human being, the history continues. Under the stimulus of the digestive fluids the bladder contracts, the toe of the sock is turned out, or evaginated, with a "pop," and here we have the "head" of a tapeworm, ready at once to attach itself and begin to grow segments.

Taenia solium is rather rare in this country, because we do not often eat half-raw pork, and our system of meat inspection is pretty efficient. But another species, *Taenia saginata*, occasionally manages to find its way into our systems through the medium of underdone beef, for this time it is the ox instead of the pig that acts as intermediate host.

A modification of the straightforward history of the cysticercus is found in the case of some tapeworms, where the original embryo gives rise not only to one, but to large numbers of "heads" which may eventually become adult worms. One such case is that of *Echinococcus granulosus*, one of the most formidable parasites of man. The adult *Echinococcus* is a tiny worm, only a few millimetres long, and possessing only three or four segments, which lives, often in large numbers, in the intestine of the dog, jackal, and wolf. The eggs, if swallowed accidentally by any of a large number of other animals, including man, sheep and ox, give rise to embryos which wander, usually into the liver, but sometimes into other organs, and even occasionally into the brain. The embryo there grows into a bladder-like structure called a "hydatid cyst." This, in some cases, may be as large as a child's head. The cyst is filled with fluid, and on the inside of its wall there are formed by budding large numbers of little "brood-capsules," within each of which again there may be formed as many as ten to thirty tiny scolices or tapeworm heads. Daughter cysts may also be budded off from the original hydatid, and these may produce further crops of scolices. The brood-capsules often rupture and let the scolices escape into the fluid within the hydatid. If the hydatid is punctured by the surgeon during its removal by operation, and fluid is allowed to escape, some of the daughter cysts may lodge elsewhere and start new hydatids. The same thing may happen, of course, as the result of spontaneous or accidental bursting of the hydatid, and innumerable new cysts may be formed. Such cases may be fatal, and hydatid of the brain is almost invariably so. After what has been said, it will be obvious that there is considerable danger in the indiscreet handling of dogs, especially of farmers' dogs, which may possibly be harbouring the adult of *Echinococcus*.

Tapeworms generally choose their intermediate hosts carefully, with a view to being eventually swallowed by the right final host. Thus most of the dog's tapeworms are found as larvae in rabbits or sheep. One of the cat's tapeworms makes use of the mouse and rat. Several tapeworms of ducks are transmitted by water-fleas such as *Cyclops*, or *Cypris*. Some of the fowl's tapeworms live first in house-flies and earthworms, so as to be at hand when the fowls are picking over the rubbish-heap; others in snails and slugs. The commonest of all the tapeworms of the dog and cat (*Dipylidium caninum*) has hit upon a very ingenious scheme. Dogs and cats, of course, must very often swallow their own fleas and lice when licking themselves, so this worm has its cysticercus stage in the flea and in the louse, *Trichodectes*. The lice, which feed on general débris, can swallow the eggs, but of course fleas, with their mouth-parts adapted for sucking blood, cannot do so as adults. It has been shown, however, that the infection of the fleas takes place in the larval period. The eggs pass unaltered down the intestine of the flea-larva until they reach its posterior region, where they hatch, and the little six-hooked embryos work their way through the wall of the intestine into the body-cavity. They do not continue their metamorphosis until the flea has passed through the pupa stage and become an adult. Then they develop into tiny cysticerci capable of infecting the final host. *Dipylidium*, like some other tapeworms, endeavours to ensure that more than one egg shall be swallowed at a time by the intermediate host, by having the eggs enclosed in little packets or egg-capsules, each containing from about five to twenty eggs.

Only in two genera of tapeworms has it so far been shown that the complete life-history can be gone through in one kind of host. One of these is *Hymenolepis*, in certain species of which, in rats and mice, and probably man, the cysticercus lives in the villi of the final host's intestine. Even here, however, the eggs probably must first reach the open and be swallowed, so that there is always the chance of infecting a fresh individual.

Before leaving the tapeworms I must give one example of another type of life-history. So far we have dealt only with the Taenioid cestodes. The worm I shall now speak of, *Diphyllobothrium latum*, belongs to quite another group. This worm, the "broad tapeworm," as it is sometimes called, has been known for many years to infect man through his habit, in certain countries, of eating raw, or nearly raw, fish, such as trout and pike. The larval stage was known to be an elongated ribbon-like creature, quite unlike a cysticercus such as we have been discussing, found among the muscles of these fishes. It was also known that the six-hooked embryo, when it hatched from the egg, was surrounded by a ciliated envelope and able to swim about in water. But attempts to infect the fish directly with these larvae were not successful, and it is only during the last five or six years that the gap between these known stages has been filled up. We now know that the embryo must first be swallowed by certain water-fleas or Copepods (species of *Cyclops* and *Diaptomus*), in which it develops into what has been called a *procercoid*. This, when the water-flea is swallowed by the fish, gives rise to the later larval stage, or *plerocercoid* and so becomes infective for man.

Let us now consider some examples of the Nematodes or Round-worms. The life-histories here fall into two well-marked groups. We have, on the one hand, forms which have what is called a direct development, involving the invasion of one host only, which, having once entered it, the worm does not leave again. On the other hand, there are many Nematodes which, like the majority of the Flukes and Tapeworms, have an intermediate host, and what we call an indirect development. In neither case, however, do we find among Nematodes any of those strange transformations that we have seen among the other groups. A young Nematode, once it has left the egg-shell, is very like its parents, in outward form at least, and could not as a rule be taken for anything but a Nematode. The chief periods in its larval life are marked by moults, when the entire cuticle is shed, together with the lining of the mouth and oesophagus. Of these moults, as far as we know, there are always four.

Among Nematodes with a direct development there are some whose life-history is very simple. The little "threadworm" or "pinworm" of man, *Oxyuris* (or, more strictly, *Enterobius*) *vermicularis*, lays eggs which, when they leave the alimentary canal of the host and reach the open, already contain fully-developed embryos capable of infecting another human being, or of reinfecting the same one. On being swallowed, these eggs simply hatch in the intestine, and the larvae grow in a few days into adults. But in some cases life-histories, which were long supposed to be of this simple character, have now been shown to be much more complex than was suspected, and to involve migrations within the body of the host of a very remarkable kind. The eggs of *Ascaris lumbricoides*, the largest roundworm found in the intestine of man, are not immediately infective when laid, but have to wait for from ten days to a month in the outer world for the embryo to develop. Then, when swallowed, they hatch, but the larva does not at once settle down in the intestine, as used to be supposed. On the contrary, it proceeds to burrow into its walls, and wriggles about until it penetrates one of the tiny capillary blood-vessels. It is now carried passively along in the blood-stream, until it eventually reaches the network of capillaries in the lungs. Here it gets stuck in one of the finer branches, and in its struggles it ruptures the walls of the tiny blood-vessel and its surrounding tissues, and so at length reaches one of the little air-spaces in the lung. In the lung, where it is, of course, admirably supplied with oxygen, it lives for some days and undergoes a certain amount of growth and development. All the time it is making its way along the branching system of bronchial tubes, and eventually, when it is nearly ready for the last moult, it reaches the windpipe. Up this it struggles (probably assisted by the upward current produced by the cilia of the windpipe itself), until it passes through the larynx and finds itself once more at the entrance to the oesophagus. Now it is swallowed for the second time. The fourth larval skin, which protects it from the digestive juices while it passes through the stomach, is soon shed after it reaches the intestine, and now all it has to do is to stay there and to grow into an adult worm and reproduce its kind.

All this remarkable history has only been worked out during the last five years or so in the case of *Ascaris*. But it has been known for a longer time that a similar migration takes place in the case of the hookworms, *Ancylostoma* and *Necator*, for the larvae of these worms have been found to have the power of penetrating through the skin of the host and eventually reaching the intestine. This discovery, like many discoveries, was the result of an accident. Looss, while handling a culture of Ancylostome larvae, spilt some on his hand, and three months later found he was infested with the adults. He then started a series of experiments, and found that this skin penetration was a normal occurrence. Hookworms abound in tropical countries, and are probably productive, directly or indirectly, of more sickness and feebleness, both of body and mind, than any other single cause. A great deal of this might be prevented if the natives of such countries adopted the simple precaution of wearing boots ; but of course, going about barefooted as they do, where sanitary arrangements are primitive or unknown, they are constantly being exposed to the attacks of the hookworm larvae, which swarm in moist soil, and actually climb up the grass when it is wet with dew.

We will now look at some of the cases where development is indirect, an intermediate host being made use of on the way to the final host. Some of the simplest cases are among the family *Spiruridae*, where an insect host is first chosen. For example, a worm called *Spirocerca sanguinolenta*, which lives in tumours of the oesophagus and stomach of dogs, is at first a parasite of certain dung-beetles and of various small vertebrates which feed on the beetles. Similarly, dung-beetles and cockroaches apparently harbour the early stages of *Gongylonema*, a parasite of cattle, pigs and other domestic animals. The infection of such animals depends, of course, upon the accidental swallowing of the insects with their food. *Protospirura muris*, a worm which inhabits the stomach of mice and rats, is believed to pass its larval stages in the tissues of the meal-worm (the larva of a beetle, *Tenebrio molitor*). Mealworms live in and feed upon the same kinds of food that mice and rats are fond of, but they are themselves regarded as a delicacy by these animals, for I have seen tame mice sit up holding a mealworm in their paws and munching it just as a child eats a banana. In all such cases as those I have referred to, the eggs of the worm, when swallowed by the insect host, give rise to larvae which penetrate into the connective tissue or the body-cavity, and there induce the host to form round them a cyst composed of cells derived from its own tissues. This, which is probably really a defensive measure on the part of the host, is a process somewhat analogous to the production of galls on plants when invaded by insects. Here the little worms wait, undergoing all but the last moult, until the insect is eaten by some higher animal. Should this animal not be of the right kind, the larvae, whose cysts are digested, generally migrate again into a safe place within its body and become re-encysted. But if the animal is the proper host they moult for the fourth and last time, and proceed to settle in its stomach, or in whatever situation they prefer, and become mature.

These are cases where the intermediate host is merely a passive agent in transmitting the parasite to its final host. But we know of some where the part played by the intermediate host is an active one. Thus in the case of certain Filariid worms the larvae are at first liberated into the blood-stream of the final host, for example man, and are then taken up by mosquitoes or other blood-sucking flies when sucking blood. They undergo part of their life-history in the mosquito or fly, which is in every case one of two or three special kinds in which alone the worm can carry on its development. Generally speaking, what happens is that the larvae burrow through the alimentary canal of the insect into its body-cavity, and then make their way into its thorax, where they stay and grow for a time. When they are ready, they migrate towards the base of the insect's proboscis, and when it bites a new victim they wriggle down the proboscis (the insect itself, feeling the irritation, sometimes helps them along with its legs), and so arrive on the skin of the final host. This they at once burrow into, and so eventually reach the connective tissue or the body-cavity, as the case may be, where they grow to maturity. The parasite is thus wonderfully adapted in its habits to both the intermediate and the final hosts. But there is a more wonderful thing still about some of these Filariid larvae. In man, it has been found that one kind of Filariid is carried only by mosquitoes that bite at night, and another only by flies that bite by day. Now it has been observed that the Filariid larvae are not equally abundant in the peripheral blood—that is, in the blood-vessels in and near the skin—at all times of the day and night. At certain times they seem to retire to the more deeply-seated blood-vessels. They accumulate, for example, in those of the lungs, perhaps for the sake of abundant oxygen. But it has been discovered that they are always at hand near the skin at the proper time for their own favourite kind of insect to take its meal. The larvae of these two kinds of worm were called "nocturnal" and "diurnal" on account of this habit, before it was known that mosquitoes and other blood-sucking flies had anything at all to do with them.

Another human parasite of some interest may be mentioned here, as it is supposed to be more or less connected with the Filariid family. This is the Guinea-worm (*Dracunculus medinensis*), which is thought by some people to have been the "fiery serpent" that troubled the Children of Israel during their wanderings in the wilderness. This parasite lives as an adult in the connective tissue under the skin, where it may cause painful abscesses. When gravid, the female worm comes to the surface, and a blister forms over the spot where its head lies, and presently bursts. On contact with water, as when the host is bathing or wading through a swamp, the worm discharges its embryos into the water. These somehow penetrate into the body-cavity of tiny water-fleas (*Cyclops*), probably being first swallowed by them. Here they undergo two moults in the course of about ten days, and are then infective for the final host. Persons who incautiously drink water containing the *Cyclops*, without first filtering or straining it, may thus take in the larvae of *Dracunculus*, which then wander about the body until, in about a year, they reach the mature condition.

The two main types of life-history that I have indicated among Nematodes have, of course, many degrees and variations. I shall now conclude by mentioning two or three curious departures from the general rule. The first is the life-history of the dreaded *Trichinella spiralis*, which has caused from time to time, even in quite recent years, serious epidemics in man. This tiny worm lives as an adult in the small intestine, and at this stage is comparatively harmless, though it may cause dysenteric symptoms. But unfortunately the same individual serves as host for both the adult and the larva, and it is on this account that *Trichinella* is a dangerous parasite for man. The pregnant females burrow through the wall of the intestine into the lymph-spaces, and there discharge their embryos, which get into the blood-stream or into the body-cavity, and are carried all over the body. They attack the muscles of the host, especially those of the diaphragm and chest, and each takes up a position inside one of the microscopic muscle-fibres, where it becomes surrounded by a cyst. A few of these cysts probably do no serious damage, but when they are present in millions, as is often the case, the final result is degeneration of the muscles, often accompanied by severe asthma or pneumonia, which is frequently fatal. Besides man, the pig and the rat act as hosts for *Trichinella*, and the supply, in some countries, is thus kept up, for though man may avoid eating pork imperfectly cooked, it is impossible to prevent rats from ever having access to it, and moreover, rats will eat the carcases of their dead brothers. The rat, therefore, is to be looked upon as the reservoir of this disease, as it is of other and more serious diseases, like plague.

Another kind of life-history that should be mentioned is that of another human parasite, *Strongyloides stercoralis*. This is a very small worm that lives in the lower part of the intestine. The most interesting point about it is that it has a free-living generation alternating with the parasitic generation. And this is not all, for while the free-living generation consists of males and females in the usual way, the parasitic generation consists of females only. These are capable of reproduction without the assistance of a male. Moreover, they differ so much in appearance from the free generation that if they had not been grown and studied in cultures no one, probably, would ever have suspected that the two forms belonged to the same species, or even to the same family. There are other forms (*Rhabdias*) with a similar life-history, the parasitic generation of which lives in the lungs of such animals as frogs and slowworms.

Lastly, I may refer briefly to the life-history of *Mermis* and its relatives. These very aberrant Nematodes are parasitic only in their larval stages, and free-living as adults. The larvae are usually hatched in the soil or in water, and then apparently seek out some insect or insect-larva, or sometimes another creature, such as a snail or slug. They are provided with a sharp stylet in the mouth, with which, in some cases, they are said to bore their way into the host. At first they have a complete alimentary canal, like any other Nematode, but after settling in the body-cavity of the host they lose the posterior opening, and the intestine becomes modified into a sort of solid fat-body for storing up food, which the worm apparently absorbs through its skin from the juices of the host. The worm's oesophagus becomes reduced to an exceedingly narrow duct, representing only the cuticular lining of an ordinary Nematode's oesophagus, and appears to lose its connection with the fat-body, so that it is very doubtful whether any food can be taken in by the mouth. The animal now grows until it is nearly as large as the adult, but it is still a baby, and quite incapable of reproduction. It lies closely coiled up in the host's abdomen, taking up nearly all the space, and sometimes producing disastrous effects on the organs of the host, by depriving them of their proper nourishment. In a species that Mr. Crawley and I studied, which lives in ants, the worms attack only female ants, and all the infected individuals fail to develop their wing-muscles properly, and also have very much undersized wings, so that they are quite unable to fly. Besides this, the ovaries are almost completely atrophied and fat-bodies are absent. At last, when the worm has finished growing, it bursts its way out, piercing a hole in some soft part of the host's skin, and wriggles away into the soil or water. Here it may have to remain for anything from a few weeks to two years, before it becomes quite mature and ready to reproduce. But it never feeds again, living for the rest of its life entirely on the food which it stored up in its fat-body as a larva. One sometimes reads of so-called "showers of worms" being observed in gardens. These are generally traceable to a species of *Mermis* (*Mermis nigrescens*), the mature females of which are sometimes seen in great numbers after heavy rain in the summer, and particularly after thunderstorms. It used to be thought that when they swarmed like this they had just emerged from their hosts, but the real explanation appears to be that the sudden moisture stimulates the females, which have been living buried in the soil for about two years, to come up and lay their eggs. The males never come to the surface at all, but stay at a depth of a foot or two in the ground. There is some evidence that they are polygamous, as clusters of females have been found surrounding one male. The female of this particular species has a great habit of climbing up to a height of a foot or so from the ground on to plants, and the eggs are very peculiar, being provided with a bunch of sticky threads at each end. It has always seemed to me probable that the eggs are meant to be laid on leaves, so that they may be eaten by caterpillars.

The Hair-worms or *Gordiidae*, which are not true Nematodes, have a life-history very similar to that of *Mermis*, but a second larval stage is introduced, involving another intermediate host. The adults live in water, the female laying her eggs on the water-weeds. The first larva is a curious little creature, armed with spines and quite unlike its parents. This larva, in the best known case, attacks and bores its way into some small aquatic insect larva, such as that of the alder-fly. Here it waits until the host is eaten by a larger insect, generally a predaceous beetle. Now it invades the beetle's body-cavity and, like *Mermis*, grows to a large size. When it is ready to emerge, it seems to have some curious effect upon the beetle's instincts, for even beetles, which normally never go into water, when infected with Gordiids, have a most unaccountable way of committing suicide by drowning themselves in puddles, ditches and rain-water butts, and sometimes in our domestic cisterns, so that we not infrequently find a *Gordius* coming through the tap.

Of course, we know the life-histories as yet only of a very few of the enormous numbers of parasitic worms known to exist. The difficulty of tracing the intermediate host is often very great, so that up to the present even the life-histories of some of the parasites of our domestic animals, such as the very common and sometimes destructive tapeworms of the sheep, remain wrapped in mystery. There are also serious gaps in the existing accounts of some of the life-histories which we sometimes pride ourselves on having unravelled. However, we know enough to be on the look-out for almost any possibility, and we shall no longer be content to accept an imaginary history merely because it seems so obviously the most probable one. In helminthology, as elsewhere, it is generally the unexpected thing that happens.

Entomology, Ancient and Present Day.

By Robert Adkin, F.E.S.—*Read October 9th*, 1924.

Entomology, the study of insects, claims antiquity with the older of the Natural Sciences, and like them has made its greatest advances at the times of the highest civilisations. There are records dating back more than four thousand five hundred years, which show that the Chinese had sufficient knowledge of insects to enable them to select at least one species of moth to cultivate for the sake of its cocoon, which they turned to account; the silk industry receiving royal encouragement even at that early date. That the ancient Egyptians, too, knew something of the habits of insects is evidenced by their use of the scarab—a likeness of the Mediterranean dung beetle (*Scarabaeus sacer*), cut in stone or other hard material; the suggestion being that they connected the form of its pellet with that of the sun, and, being sun worshippers, treated it with reverence.

Biblical references to insects are frequent, and from their purport one gathers that their writers were conversant with the habits of many species. To take just one example:—"Proverbs," vi., 6-8, "Go to the ant thou sluggard, consider her ways, and be wise. Which having no guide, overseer or ruler, provideth her meat in the summer and garnereth her food in the harvest." How often have we been told that this is a myth; that what ants are seen to carry are their pupae, which look like grains of corn, and that it must be this operation which is referred to in the quotation. There is, however, nothing in the quotation about grains of corn, but there are harvesting ants which do garner their food and of them at least one species, *Messor barbatus*, inhabits the sandy tracts of the Mediterranean littoral, and there is little doubt that this, or an allied species, was well known to the Hebrew writers, and that its habits had been carefully studied.

The philosophers of the period of the higher Greek civilisation gave the study of insects equal attention with that of the higher animals. They appear to have acquired a fairly good knowledge of the structure and economy of many species, yet they do not appear to have fully grasped the question of insect metamorphoses, and it may be that this led to their belief in spontaneous generation. The writings of Aristotle (384-322 B.C.) may be taken as giving a summary of the knowledge of the period: a few quotations from his published works may therefore be not out of place. Regarding structure, to give a short example, he says, " the parts concerned in nutrition are not alike in all insects, but show considerable diversity. Thus some have what is called a sting in the mouth, which is a kind of compound instrument that combines in itself the character of a tongue and of lips. In others that have no such instrument in front there is a part inside the mouth that answers the same sensory purposes. Immediately after the mouth comes the intestine, which is never wanting in any insect. This runs in a straight line and without further complication to the vent; occasionally, however, it has a spiral coil. There are, moreover, some insects in which a stomach succeeds to the mouth, and is itself succeeded by a convoluted intestine, so that the larger and more voracious insects may be enabled to take in a more abundant supply of food. More curious than any are the *Cicadae.* For here the mouth and the tongue are united, so as to form a single part, through which as through a root, the insect sucks up the fluids on which it lives."[1] Although the views herein expressed may not all be strictly in accordance with present-day knowledge, they tend to show, that even in those remote times, there was a good deal known of insect anatomy. With regard to metamorphoses they were less well informed, for Aristotle tells us that "All insects engender grubs, with the exception of a species of butterfly; and the female of this species lays a hard egg,"[2] and goes on to say, " the so-called psyche, or butterfly, is generated from caterpillars which grow on green leaves. At first it is less than a grain of millett; it then grows into a small grub; and in three days it is a tiny caterpillar. After this it grows on and on, and becomes quiescent and changes its shape, and is now called a chrysalis. The outer shell is hard, and the chrysalis moves if you touch it. It attaches itself by cobweb-like filaments, and is unfurnished with mouth or any other apparent organ. After a little while the outer covering bursts asunder, and out flies the winged creature that we call a psyche, or butterfly. At first, when it is a caterpillar, it feeds and ejects excrement; but when it turns into a chrysalis it neither feeds nor ejects excrement."[3] There is little doubt that the species referred to is the large garden white butterfly (*Pieris brassicae*), and the account given is a very good one of its life-history. Although he says that the " butterfly is generated from caterpillars," he has already said that " a species of butterfly lays a hard egg," and I think we may take his words " At first it is less than a grain of millett; it then grows into a small grub;" to show that he recognised that the grub came from the egg.

But then he goes on to say, " Gnats grow from ascarids; and

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[1] " De Partibus Animalium," Book IV., Chap. 5, 682[a], 10.
[2] " Historia Animalium," Book V., Ch. 19, 550.[b]
[3] " Historia Animalium," Book V., Ch. 19, 551.[a]

ascarids are engendered in the slime of wells, or in places where there is a deposit left by the draining off of water. This slime decays, and first turns white, then black, and finally blood-red; and in this stage there originate in it, as it were, little tiny bits of red weed, which at first wriggle about all clinging together, and finally break loose and swim in the water, and are hereupon known as ascarids. After a few days they stand straight up on the water, motionless and hard, and by and by the husk breaks off and the gnats are seen sitting upon it, until the sun's heat or a puff of wind sets them in motion, when they fly away."[4] Thus we see the doctrine of spontaneous generation clearly expounded, and although we now know that it was an erroneous doctrine, it stood unchallenged for very many centuries.

Before leaving this period one other quotation from Aristotle will not be without interest: he says, "The wasps that are nicknamed 'hunters,' less in size, by the way, than the ordinary wasp, kill spiders and carry off the dead bodies to a wall, or some such place with a hole in it; this hole they smear over with mud and lay their grubs inside it, and from the grubs come the hunter wasps."[5]

From the foregoing quotations it will be seen that these old Greek philosophers were keen observers, and although the deductions they drew from their observations may not always, according to recent knowledge, have been the correct ones, yet much of their work was good, and may be perused with advantage even in these more enlightened times. They knew that they had not mastered Nature's secrets, for Aristotle admits that all that takes place is not cleared up; even if it were, we must rather rely upon observations than reasoning, and rely upon reasoning only if it agrees with manifest facts.[6] A very good maxim that we may well bear in mind.

During the Roman period no particular advance was made in entomological knowledge, and throughout the Middle Ages, if there was any thought of insects at all, it was in effect to teach that they were loathsome creatures to be avoided.

About the middle of the sixteenth century insects again began to be studied, and in following the progress of entomology from that period, it will, I fear, be necessary to traverse some well-trodden ground; for there were no entomologists, as such, in those days, and all our records are by the "Ancient Naturalists," whose work we have already considered in a previous paper; we may, however, in the present case, perhaps be able to approach it from a somewhat different angle.

Of this period Aldrovandi, an Italian, was one of the first to give

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[4] "Historia Animalium," Book V., Ch. 19, 522.[a]
[5] "Historia Animalium," Book V., Ch. 20., 552.[b]
[6] "De Generatione Animalium," Book III., etc.

insects equal attention with other orders; at any rate, of a complete Natural History that he compiled, the only volumes that he published during his life-time were the three treating of the birds and the one of insects, the remaining nine volumes being compiled from his manuscripts by his pupils and published after his death. In this insect volume he sets out a somewhat elaborate table of classification, in which he makes two chief divisions, "Terrestria," in which he includes among other creatures, the woodlice, earthworms, and slugs; and "Aquatica," which included the Annelids and Starfishes among a host of other things. Yet his work is of interest as giving the first account of many of our familiar species.

During the first half of the seventeenth century little, if any, progress was made. Thomas Moufet, an English physician, compiled an "Insectorum Theatrum," but it is doubtful if it contained any original work. Johannes Goedartius also gave us a "Metamorphoses and Natural History of Insects," but it is little more than a recapitulation of numerous experiments in rearing sundry larvae to maturity; it has, however, the merit of a good deal of original work, even though not of a very high order, and perhaps not always quite accurately presented. The latter part of the century, however, was a time of great advancement in the knowledge of insects. Francesco Redi, an Italian physician, had, in the course of his training, studied the works of Aristotle, whose dictum had, up to this time, been accepted without question.[7] But he was not satisfied that the teaching of Aristotle was correct in all its details, particularly in regard to the theory of spontaneous generation. So Redi set to work to prove or disprove it by careful experiment, and had no difficulty in showing, that without the intervention of the parent insect, no insects could be produced. Maggots were found in putrifying meat, only when flies had had access to it and on it had deposited their eggs. Gnat larvae were to be found only in water which the parent gnat had visited. So the doctrine of spontaneous generation was for ever controverted, and those who thereafter were to study the economy of insects had a clear basis on which to work. It may be said, this was such a simple question that it might have been settled at any time, but I would remind you that Aristotle's dictum had stood, without challenge, for little short of two thousand years, and was in those times regarded as little short of divine teaching, and it needed the strength of a Redi to controvert it.

Insect anatomy, too, was receiving attention. Swammerdam, a Dutch physician, realised that insects played so large a part in the scheme of Nature, and that a knowledge of their structure was of

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[7] William Harvey, an Englishman, had, it is true, questioned the possibility of spontaneous generation, but had produced no evidence to support his theory.

such importance, that he gave much of his time to collecting and dissecting them. His work upon the louse, gnat, bees, ants, and many other insects, is of lasting value, and compares favourably with much of our modern work. Many of his more important researches are recorded in his "Historia Insectorum Generalis," and his "Biblia Naturae," a great work, illustrated with some fifty-three finely executed copper plates, which are reproduced with an English translation by Flloyd, under the title of "The Book of Nature or History of Insects."

Leeuwenhoek, another Dutchman, also did good work, especially on fleas and aphids, proving, by dissection, that the latter are largely viviparous. The results of his chief work he sent to the Royal Society, and it is there recorded in their "Philosophical Transactions."

Nor was the investigation of the insect fauna of distant lands neglected in these early times. Madame Maria Sybilla Mérian, fired possibly by the reports she had heard of tropical Nature, and, may be, having seen some of the wondrous creatures that sea-captains had brought home with them, set sail in 1699 for Surinam, a province of South America now better known as Dutch Guiana. This was no light undertaking for a woman in those early times, for not only did she brave the perils of the ocean, but spent some two years working out the fauna of that uncivilised country, and on her return published a magnificent tome, illustrated with some sixty plates depicting the wonderful creatures that she had met with, and in many cases showing their life-histories. She also published a book on European insects, with a large number of handsomely coloured plates showing their life-histories. We owe a great debt to the energy of this intrepid woman, for, so far as I am aware, only one other naturalist has worked Dutch Guiana, and our present knowledge of its rich insect fauna is little more than that given to us by Madame Mérian more than two hundred years ago.

It was at about this period, too, that John Ray was at work upon his "Historia Insectorum," in which he described many thousands of species with great accuracy. It was a stupendous work and destined to be one of the, if not the chief source of information for the student of insect life for many years to come. It was founded on a system of classification, of which Miall very truly says, "Without claiming for Ray that he possessed a genius for the discovery of hidden relations, we may rank him as the worthiest representative, with respect to knowledge at least, of systematic Natural History in the seventeenth century."[8] Nor must we, in this connection, omit to mention Martin Lister, for it was he who published Ray's "Historia Insectorum," some year's after Ray's death. He was

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[8] Miall, "The Early Naturalists," p. 130.

also responsible for the publication of Goedartius' work "done into English," in which a few notes of his own were inserted. He tells us that the ichneumons that are bred in caterpillars are the offspring of ichneumon parents; that naked caterpillars are a more acceptable food to birds than such as are hairy, and that caterpillars found frozen hard will, when thawed, crawl about and bestir themselves nimbly to get away; facts which had not previously been recorded, and which are all worth remembering.

Thus were the foundations of Entomology laid; and so we drift into the eighteenth century, with its ever increasing number of workers, most of them engaged upon the working out of the life-histories of the species that they met with, some content to simply figure them with a brief note of their origin, while others accompanied the record of their work by elaborate coloured plates.

Jacob Petiver, an apothecary of London and student of Natural History, by no means neglected the insects. In his "Gazophylacii" (1702), we find them scattered throughout the work, but in a later and amplified edition by Empson, entitled "Opera Historiam Naturalem Spectantia" (1767 ed.), some attempt is made to classify them and to arrange them under the countries from which they were obtained, his six plates of British butterflies, with their accompanying two pages of notes and frequent references to Ray's work, give a very fair representation of the British butterfly fauna as known in his time.

Eleazar Albin, an English artist, gave us a book of "A Hundred Copper Plates Curiously Engraven from the Life" (1720), in which are depicted many of our common species together with their food plants, and in some cases the parasites which infest them, together with notes on their life-histories. The book was sufficiently popular to run into a second edition.

Then followed Benjamin Wilkes, with his "English Moths and Butterflies," which took fourteen years to publish (1747-60), and also ran into two editions. He gives interesting, and generally correct notes, and the execution of the plates in the first edition are remarkably good.

Réaumur, a Frenchman, was an indefatigable worker in insect economy, and published the results of his labours under the title of "Mémoires pour servir à l'Histoire des Insectes," a book of six large tomes, liberally illustrated with an abundance of finely executed copper plates. He was a fascinating writer, "but his style is so clear as to render everything plain, and the facts which he relates are rigorously true. His work can never cease to be studied with the keenest interest by those who would frame an exact notion of nature, and of the marvellous variety of means which she employs in the preservation of organisms apparently so easily destroyed." [9]

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[9] Cuvier, Life of Reaumur, "Bibliographie Universale."

In Germany, Roesel von Rosenhof was similarly engaged. He busied himself with all orders of insects and paid a good deal of attention to their structure as well as to their economics, and has left us five bulky volumes, profusely illustrated with, generally, remarkably well produced coloured plates. It is difficult to say just what is the best of his work, but attention may be drawn to his carefully worked out life of the ant lion; many of his plates of Lepidoptera are also remarkably clear and instructive.

It was during this period that Carl von Linné, a Swedish Naturalist, better known perhaps as Linnaeus, came on the scene with his "Systema Naturae," that was destined to revolutionise all previous ideas of classification, and on which our present-day system is founded. In it he assigned every animal and plant to its class, order, family, genus and species, thus evolving order out of chaos. His aptitude for recognising affinities, his terse method of description, were his great assets. To no student of nature was the "Systema Naturae" more welcome than he, who studied insects, for no class had, up to the time of its publication, been in a greater state of confusion, both in regard to names, which many known species lacked altogether, and as to their affinities; and its publication must be regarded as an epoch-making event in the history of insect study.

But no system, however perfect, is likely to stand long without challenge, and within a few years of the publication of Linnaeus's final edition of the "Systema Naturae," Fabricius produced his "Systema Entomologiae," which was shortly followed by his "Entomologia Systematica Emendata et Aucta." Fabricius had studied natural history under Linnaeus at Upsala, and no doubt had acquired much of his teacher's keen insight for specific differences and terse and accurate description. But he seems to have considered that Linnaeus's system might be improved upon, and so he published one of his own, already referred to, in which he made some alterations in arrangement and terms, and named and placed many new species that had been discovered since the older publication was issued. Fabricius's work is useful when regarded as an amplification of that of Linnaeus, rather than as supplanting it.

It will be noted that up to Linnaean times the term "Entomology" had not been used in the titles of the works that have been quoted, nor, so far as I am aware, had it been used by any of the older authors, and we are, I believe, indebted to Linnaeus for its introduction. In the "Systema Naturae" (ed. x., p. 341), he tells us "The more renowned ENTOMOLOGISTS have won fame by figures, properties and attributes—

Metamorphoses :—*Goedart, Merian, Albin, Frisch,* etc.
Philosophies :—*Swammerdam, Réaumur ! De Geer.*
Descriptions :—*Ray, Fauna suecica.*
Monographs :—*Lister, Schaeffer, Clerck.*

and as we have seen Fabricius adopted the term in the titles of his works.

The publication of these "systems" gave a great impetus to entomology. Workers were able to classify their specimens and to communicate with one another intelligibly. Work that had long been accumulating could now be put in order and issued, and as a consequence, the closing years of the eighteenth and first half of the nineteenth centuries saw the publication of a vast number of works, many of them illustrated with elaborately coloured plates, the like of which are rarely equalled even in the present day. To mention them all would be impossible, and indeed unnecessary, but some few are of such outstanding importance that a brief reference to them may be permitted.

One very remarkable work is that commenced by Christiaan Sepp, a Dutchman, continued by Jan. Ch. Sepp, and later by Snellen von Vollenhoven and others, the first part of which was issued in 1762, and the work is still being published. It deals with the life-histories of lepidoptera, and is remarkable for the beauty of its plates. When Sepp died it was carried on by his successors and has now attained to twelve complete volumes and some odd parts, and the excellence of its plates have been well maintained throughout. Esper (1777-1805), a work in five volumes and several supplements, is more important. It is fairly well illustrated in colour, and in it many species are described for the first time. Of yet greater importance to the lepidopterist are Hübner's "Sammlung Europaischer Schmetterlinge" (1796-1834 ?), his "Sammlung Exotischer Schmetterlinge" (1806-1824), and other works. Hübner was by trade a draughtsman, and no doubt by inclination an entomologist, and it appears that it was largely a labour of love with him to faithfully represent every species of butterfly and moth to which he could obtain access. Unfortunately his letterpress was scanty, but this was ultimately made good in another finely illustrated work in six volumes, by Herrich-Schäffer, entitled "Systematische Bearbeitung der Schmetterlinge von Europa," which is in effect the text, revision and supplement, to Hübner's "Sammlung Europaischer Schmetterlinge," and which was published between 1843 and 1856.

In our own country Moses Harris produced "The Aurelian or Natural History of English Insects" (1766), a folio book with coloured plates and, at the time was sufficiently esteemed to be reissued in 1794, with the text in both English and French, but it is not a work of any great merit. Donovan's "Natural History of British Insects" (1792-1813), a work in sixteen volumes, gives life-like coloured figures of insects of all orders; the letterpress is brief but usually to the point. Lewin's "Insects of Great Britain" (1795), notable chiefly for its beautiful plates, got as far as the end of the butterflies and then ceased. John Curtis's "British Entomology" (1823-1840), was arranged on more scientific lines than the foregoing. The plates are good and illustrate the type of each genus, all orders being included, and in the text the generic and specific characters are fully dealt with. It was, in its time, perhaps the best book on British Entomology. It was originally issued in 193 numbers, and was reprinted in 1859. Stephens's "Illustrations of British Entomology" (1828-1846), was arranged on similar lines, and the plates, for careful production, vie with those of Curtis. It consists of twelve volumes and, like Curtis's work, embraced all orders, and, even in the present day, may be regarded as a useful work of reference. Unfortunately he, in common with most authors of this period, was a little too credulous as to the occurrence of rarities in Britain and as to the specific value of many merely varietal forms.

Haworth's "Lepidoptera Britannica" (1803), is a synonymic catalogue with brief descriptions, both generic and specific, and each species is given an English name; many of these were grotesque, such as "The jaundiced Drab," "The Goose-feather," and so forth, and have long since fallen out of use. Stephens's "Systematic Catalogue" (1829) embraces all orders of insects, and is as its title page says, "An attempt to arrange all the hitherto discovered indigenous insects in accordance with their natural affinities, containing also the references to every English writer on Entomology, and to the principal foreign authors," and was, in its day, a useful work.

Wood's "Index Entomologicus" (1839) is a well illustrated work, its feature being the coloured representation of each species of lepidoptera in a uniform size, with a series of marks against each figure indicating the approximate size of the species. This was a novel experiment, but seems to have found favour, as the work was reprinted in 1854. The letterpress was scanty, consisting only of the Linnean name, the English name, a brief reference to new genera or synonyms, and the "habitat and when found."

I must not omit to mention that classic "An Introduction to Entomology, or Elements of the Natural History of Insects," by Kirby and Spence (1815-26). It is all that its title claims for it. Views may have changed as to some details during the century since it was first published, but in its main teaching it remains sound, and may be read with advantage even in the present day. It has passed through many editions and, I am pleased to note, appears to be still in request.

I have dwelt somewhat lengthily on these publications of the first half of the nineteenth century, and, being by inclination a lepidopterist, perhaps given undue prominence to those dealing with that order, even to the exclusion of others of equal importance. But I have little doubt that it was the publication of such works, especially those that are often referred to irreverently as "picture books," that gave rise to an army of Butterfly and Beetle hunters that sprang up about that period; the founding of Entomological Societies [10], and the publication of the "Entomological Magazine [11], were no doubt also an encouragement. The books were such as to enable the collectors to name their captures; the Societies gave them ready means of intercourse and discussion; while the magazines provided opportunity for the publication of their views on such subjects as interested them.

I am afraid that these "devotees of the net and pin" were not regarded with any great amount of respect by the general public of their day; they may have been tolerated, but were subject to a certain amount of caricature both by illustration and in verse, and even in our own times it is doubtful whether entomology is always regarded very seriously. The innocent "bug-hunter" may still sometimes be treated with a certain amount of ridicule. But I would say do not discourage him; do not, because you may have progressed a little further, look down upon him. He often, perhaps unknowingly, fills his part in the science, and many a leading light has been attracted to serious study by first being a simple butterfly or beetle hunter.

Butterfly and beetle collecting may be entomology, but entomology means a great deal more. Entomology seeks acquaintance with the insect fauna of the whole world, and to classify it in the order of its most natural affinity; it acknowledges the colossal influence of the insect world upon human welfare; it seeks to obtain an accurate knowledge of insect economy, and to apply the information thus gained for the benefit of the human race.

In the year 1848 Henry Walter Bates and Alfred Russel Wallace set out to explore the country bordering on that vast river of South America, the Amazon and its tributaries, where they spent some years; at first working together, but later separating and working different districts. Wallace, after his return and a short sojourn in England, went to the Malay Archipelago, where he visited many of the great islands included under that comprehensive name. They collected many new forms and made great discoveries and observa-

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[10] The Entomological Club, an association for friendly intercourse, founded 1826, and the Entomological Society of London, founded 1833, are both still fulfilling their functions. The Aurelian Society, founded about the middle of the eighteenth century, and disbanded after the destruction of its library and collections by fire, was reconstituted previous to 1766, but again died out, and an Entomological Society came into being about the commencement of the nineteenth century, but also died a natural death and was succeeded as mentioned above.

[11] The "Entomological Magazine" appeared in 1833 and ran till 1838, when it ceased. The "Entomologist," Vol. I., covered 1840-2, the "Zoologist" gave facilities for entomological communication from 1843, until the "Entomologist" recommenced with Vol. II. in 1864. The "Entomologist's Monthly Magazine" also commenced in 1864; and the "Entomologist's Record" in 1890.

tions that were destined to have important bearings on the views held regarding many phases of Natural Science. The works that they have left to us, Bates's "The Naturalist on the River Amazons," Wallace's "Island Life"; "Tropical Nature"; "The Geographical Distribution of Animals," and other of their books, record their wanderings and are full of suggestion; they have been, and still should be, widely read.

In 1857 Osbert Salvin visited Guatemala, where he spent nearly a year. He was so impressed by what he was able to observe that he went out again in 1861, accompanied by Frederick Ducane Godman, and they spent some two years in exploring the Natural History of Central America. The result of their labours is recorded in the monumental work that they have left to us, "The Biologia Centrali-Americana," a beautifully illustrated book in 63 volumes, of which 46 are devoted to insects; the first volume was issued in 1879 and the last in 1915. These are but examples of the exploratory work that has been, and still is, going on in all parts of the known world, but I have said enough to show how important it is.

Economic entomology, too, made great progress during the period under review. In this favoured country of ours insect pests are seldom very troublesome, but that is not so all over the world; in many countries they become very serious and, if left unchecked, may entail heavy pecuniary losses. Let me give two or three illustrations. On the Pacific coast fruit growing is an important industry, and by some unfortunate means a coccus (*Icerya purchasi*) was introduced with orange-trees from Australia, and multiplied so rapidly as to threaten to destroy the orange crop. The larva of the coccus, the stage in which it does the damage, attaches itself to the fruit, in this case, and sucks its juice. It protects itself by a scaly covering and is therefore difficult to destroy by the ordinary means of spraying, and so forth. It was, however, known that it had a natural enemy in the larva of the ladybird (*Novius cardinalis*), which devours the coccus larva with avidity. So by importing large numbers of the ladybird, and allowing them to breed on the orange trees, the coccus pest was overcome. Then there is the memorable case of the spread of the gipsy-moth. It is not generally a particularly harmful species, but when by some unfortunate means it was introduced into the Eastern United States it very soon became so. How it spread was for some time a mystery, but careful entomological research ultimately solved it. The young larva is an exceeding hairy little creature, and it was found that when only a day or so old it had a habit of suspending itself from the trees on which it was feeding by a slender silken thread, and that when the wind blew it broke the thread and carried the tiny larva away on the breeze to quite long distances, where a fresh colony was soon established. The clusters of eggs, fastened to the tree twigs, are in winter conspicuous objects, and so by collecting and destroying them the advance could be dealt with. In our own country one of the worst pests that the fruit-grower has to contend with, and one that for many years has almost baffled control, is the woolly aphis of the apple, commonly known as "American blight" (*Eriosoma lanigera*). It is now known that a chalcid, a minute Hymenopteron, which is not a native of this country, is parasitic on the aphid, and the experiment has quite recently been tried, apparently with complete success, of introducing the chalcid to the trees affected by the aphid.

It was, I believe, Eleanor Ormerod who, in the "seventies," was first in this country to take up the study of economic entomology seriously, her "Manual of Injurious Insects" (1881) being one of the earliest publications on the subject. Now practically every agricultural college or similar institution throughout the country has its entomologist. We have, too, our Bureau of Entomology, an institution that collects information from all over the world, and is able to give serviceable advice throughout the Empire. Our Government is not noted for its liberality in supporting scientific institutions, but it has done well in establishing the Bureau. Our universities recognise entomology as an important branch of natural science, and the Government entomologist in many of our colonies holds an important office. So is it throughout the world. The close study of entomological science is becoming more and more a necessity, its close bearing upon the welfare of the state is becoming every day more apparent. Publications on economic entomology, good, bad, and indifferent have appeared during the last few years at an alarming rate; many of them are of real scientific interest, and not the least among them are a number of booklets, issued by the authorities of our Natural History Museum, at prices within the reach of all.

Of even greater importance to our wellbeing is what may be termed "medical entomology," the part that insects play in the propagation of diseases that affect human beings, and, for the matter of that, many of the higher animals also.

In the middle ages typhus fever was prevalent in this country it was so frequent among the prisoners as to be called jail-fever. It was a disease bred of filth, so it was thought at the time, and of course as sanitation improved it became less prevalent, clearly cause and effect, why worry! In the year 1665 the population of London was decimated by plague; "the black death"; "God's terrible voice"; a mystery! it rested at that. The great fire, which devastated the greater part of the city in the following year possibly put a stop to it; again cause and effect, what more was there to be said! Between the years 1859 and 1869 de Lesseps built the Suez Canal without much difficulty. A few years later he undertook the greater project of the Panama Canal, but failed; yellow fever and malaria among his workmen were at the root of his downfall. Even in comparatively recent times many parts of the tropics have been designated "the white man's grave," so rampant were malaria, sleeping-sickness, and other diseases in them—the deadly climate !

These matters are no longer regarded as mysteries; entomology, working hand in hand with her sister sciences, has gone a very long way towards solving them. Just as Redi, nearly three hundred years ago, proved that no maggots were in the meat without the intervention of the parent fly, so has it been demonstrated, within the last quarter of a century, that these fell diseases are not communicable without the intervention of the insect carrier.

Typhus fever is happily hardly known in this country in the present day, but there are many parts of the Continent of Europe and elsewhere, where personal cleanliness is disregarded, and the disease frequent. Thus opportunities for studying the way in which it is transmitted from person to person have been afforded, and it has been ascertained that the body louse (*Pediculus vestimenti* [*humanus*]) is the culprit. According to our present knowledge, the louse, having fed upon an infected person, becomes infective only after some eight, or more often nine or ten days; which seems to suggest that the fever organism undergoes some change in the body of the insect. After this period the louse is capable of transmitting the disease, either by being crushed on, or by its powdery excrement coming in contact with abraded skin; or, as the most recent investigation appears to suggest, also by its bite. Investigations of this class are not carried out without some personal danger. Only last year Bacot, one of our most experienced entomologists in this line of research, was engaged upon investigation for the Egyptian Government, by permission of the Lister Institute to which he was attached, and had substantiated the facts just recorded, when he was stricken with typhus and fell a victim to the science for which he had done so much. And in April last Major Francis William Cragg also fell a victim to the disease. He was entomological expert to the Central research institute at Kasauli, India, and had gone to Lahore, where typhus was prevalent, to further study the disease. Men such as Bacot and Cragg, whose knowledge of the manner in which the disease is propagated was of the first order, were not the men likely to take unnecessary risks, and their untimely deaths seem to suggest that there may yet be some details in connection with the spreading of typhus by lice that still await solution. Seldom, indeed, are great discoveries made without sacrifice !

During the early years of the recent war an obscure disease, known as trench fever, was very prevalent among the troops. Hastily planned, but carefully executed research, proved that it, like typhus, was carried from man to man by the body-lice, which swarmed on the soldiers in the trenches. Steps were at once taken to combat the lice, and with their practical extinction the disease was almost, if not entirely, stamped out.

The dissemination of plague by the rat-flea is now common knowledge, that fact having been ascertained, at any rate so long ago as 1907, but since that time many important discoveries have been made. Rats suffer from plague, and the flea is known to transmit the disease from rat to rat, from rat to man, and from man to man. In India the disease is endemic and from time to time breaks out into severe epidemics, during which the mortality is often exceedingly high. Now, it had been noticed that in these epidemics some districts were badly affected while others were comparatively free from the disease; rats were equally common to them all, and so were fleas; what then was the reason? A commission had been considering the matter, and having ascertained the facts already recorded, it occurred to them to make large collections of fleas and to send them to the late Charles Rothschild, than whom perhaps no one had a better knowledge of the Siphonaptera (fleas), and he was able to determine that instead of there being one rat-flea, as had been supposed, there were three species, namely, *Xenopsylla cheopis*, *X. astia*, and *X. brasiliensis*, and it was found that in the heavily plague-affected areas *cheopis* was the predominant species, while in those that were immune, or comparatively so, *astia* was the prevailing one. In plague-affected areas at higher altitudes, *X. brasiliensis* is the predominant species. It therefore appears that *X. cheopis* must be regarded as *the* plague flea, while *X. astia*, possibly on account of its reluctance to bite man, is of little consequence, while *X. brasiliensis* may be the carrier in its own special localities.

Great advances have also been made, within the last few years, in the knowledge of the method by which the insect infects its victims. The flea in feeding upon a plague-infected man, rat, or other animal, for some other rodents besides rats are liable to infection, sucks up the infection in the blood on which it is feeding. Then the plague bacilli, thus obtained, enter "the stomach and gizzard of the flea and their growth first clogs the action of the valve and then clogs it altogether. The flea, unable to fill its stomach, makes repeated attempts to feed. The contents of the pharyngeal pump are repeatedly forced into contact with the plague culture in the gizzard valve, which often extends into the oesophagus, and are regurgitated into the tissues of the animal on which the flea is vainly attempting to feed. Thus the transmission of plague by this means is not a purely mechanical process, but depends upon peculiarities in the suctorial apparatus of the flea, and the extent to which plague bacilli can multiply in the gizzard and stomach of the flea." [12]

Yellow fever and malaria are now known to be caused, not by the atmosphere of pestilential swamps as was at one time supposed, but by the bite of the mosquitos that breed in them, and elsewhere.

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[12] Hirst. "Indian Journ. Med. Res." X., No. 3, January, 1923, p. 790

Yellow fever is carried by one tropical species, *Aëdes calopus*, Mg. (*Stegomyia fasciata*, F.). It is a domestic species, frequenting houses and hiding in the dark corners of their rooms. For its breeding places it likes nothing better than the house water tank, or an old tin can on a rubbish heap that has become filled with rain water. Its habits being known there is little difficulty in dealing with it, and as a consequence, yellow fever is now a comparatively rare disease.

Malaria, however, is carried by quite a large number of species of the Anopheline group in various parts of the world; in this country *A. maculipennis* and *A. bifurcatus* being the chief culprits.

The life-cycle of the malaria parasite (*Plasmodium falciparum*) is a truly fascinating one. When first injected into the human body, by the mosquito, it is an exceedingly small organism. It at once attaches itself to, or enters, a red blood corpuscule (on this point opinions differ). Here it undergoes several changes and then splits up, the fragments each attacking a fresh corpuscule. After thus developing for about a couple of weeks, several forms are produced, these are sucked up by the mosquito, and entering its digestive tract, the remains of the blood corpuscule are dissolved, but the parasite resists digestion. The male gametocyte develops long slender filaments which become very active, the female gametocyte develops into an inactive sphere, some of the male filaments enter it and fertilization takes place in the stomach of the mosquito. As a result a new generation is begun which grows, elongates and becomes like a minute worm, which wriggles and worms itself about in the stomach of the mosquito and penetrates the wall. Here rapid growth takes place and a heavy corpuscule develops, in which spores are formed; they ultimately break loose, make their way to the salivary gland and, on the mosquito biting a human being, they are discharged into his blood, and the whole process of multiplication begins over again.[13]

Such very briefly is the life cycle of the malaria parasite. Had de Lesseps known as much about the transmission of yellow fever and malaria by mosquitos as is now known, his attempt to construct the Panama Canal might have been successful.

Before leaving the mosquitos yet one other British species needs mention. During and after the war large numbers of men were returned from various parts of the field of action, who were or had been suffering from malaria, and there was a danger that other members of the population might become infected from them. Of two species of mosquitos that might act as carriers, namely *Anopheles maculipennis* and *A. bifurcatus*, the life history was well known and

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[13] For a more detailed account see "Animal Parasites and Human Disease" by Asa C. Chandler, pp. 149-157.

they could be dealt with. But there was another species that had been proved to be a carrier, *A. plumbeus*, as to the habits of which very little was known. With a view to gaining information a "Mosquito Investigation Committee" of the South Eastern Union of Scientific Societies was set up, and with some small financial aid from the government, set to work in 1917 and on the conclusion of their labours, last year, were able to present a most satisfactory and conclusive report. [14]

Briefly, it was conclusively proved that *A. plumbeus* breeds exclusively in water-holes in trees and that it is commonly and widely distributed throughout a large part of the country. They were able to give a good account of its life-history and much useful information as to the effect of wet and dry seasons upon its prevalence, and other matters in connection with its economy, also to make suggestions for dealing with the species.

It is just thirty years since it was first suggested that tsetse-flies were the carriers of sleeping sickness. Since then much has been learned both regarding the life-histories of the flies and the life-cycle of the parasites that they convey. Tsetse-flies differ from all others of their family in the remarkable manner of reproduction. Not only do they not lay eggs, but the single developing larva is retained within the body, being nourished by special glands on the walls of the uterus. The larva is full grown and occupies practically the entire swollen abdomen of the mother before it is born. The process of giving birth to the larva is very rapid, occupying only a few minutes. As soon as born another larva begins its development, etc." [15] The larva immediately after it is born buries itself in loose soil or under dead leaves, turns to a pupa and in due course produces a fly.

Two species of tsetse-fly are known to carry the sleeping sickness trypanosome, namely *Glossina palpalis* and *G. morsitans*. The former is seldom found more than thirty yards from water and appears to need the shade of over-hanging bushes for shelter. *G. morsitans* is a widespread species, preferring a hot dry climate in open bushy country with trees.

The transmission of the disease by the fly also is remarkable. The fly having fed upon an infected animal, it may be man, antelope or other species, for many of the larger animals harbour the disease, a critical time ensues for the trypanosomes as, when the fly feeds the next time they may be swept out of its body by the new influx of blood or digested. [16] However, having once established themselves in the insect's intestine they undergo a series of changes

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[14] "South Eastern Naturalist," 1923. pp. xxxv-l.
[15] "Animal Parasites and Human Disease," p. 495.
[16] "Animal Parasites and Human Disease," p. 99.

and eventually find their way to the salivary glands ready for fresh infection.

The Warble flies, *Hypoderma bovis* and *H. lineatum*, are a cattle pest. In this country they are a nuisance, but in many countries they are of considerable economic importance. Something of their life-history has been known for many years. It was known that they lay their eggs on the legs of cattle, and it was assumed that the cattle by licking their legs conveyed the young larvae to their mouths, and that they so reached their gullets, in the wall of which they are found during autumn and winter. Recent research has shown that the latter assumption is incorrect. "The eggs are hatched on the hairs (of the legs) a few days after laying and the tiny maggots less than a millimetre long and provided with strong, sharp mouth-hooks and relatively formidable spiny armature, crawl along the hairs and bore their way directly into the skin. Thence they migrate upwards and forwards to the gullet-wall, the submucous coat of which serves as their resting place for some weeks or months in the course of their journey through the host's tissues to the final position in the back." [17]

In bringing my notes to a conclusion, I cannot help feeling that I have touched my subject all too lightly; to recapitulate the history of a science that we know has taken something like five thousand years to build up, in the course of an evening is to attempt the impossible. Yet I trust that I have said enough to show that entomology, however healthy and agreeable a pastime it may provide, is a science of the first importance. Insects are man's greatest enemy, ever subtly working for his destruction, and the more we know of their habits and methods the better shall we be armed to fight against them. The progress of recent years has indeed been great, but there remain vast fields to conquer.

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[17] "Lancashire and Cheshire Naturalist," Vol. XVI., December, 1923, p. 49.

Flies and Disease.

By H. W. Andrews, F.E.S.

Part I.—*Read November 13th*, 1924.

Introduction.—It is well known that the Diptera play an important part in Economic Entomology, not only in relation to the crops and herds of mankind, but also in relation to man himself. In the case of agriculture the Diptera are perhaps not of so much importance as some of the other orders of insects, the Coleoptera for example, or the Orthoptera: but though the ravages of dipterous pests are not so important a factor as those of beetles in Forestry, and not comparable with the devastation to crops caused by locusts, yet when we reckon up the harm wrought to greenlands by Tipulid and *Bibio* larvae; to corn crops by those of the Hessian fly and wheat midge; to root crops by various Anthomyiid larvae; and in lesser degree the depredations of the Narcissus-fly grubs among our garden bulbs; we find the sum total is by no means negligible. But when we come to animals, and still more when we come to man himself, I think it can fairly be claimed that the Diptera are supreme among the orders of insects in their economic importance; and I propose in this paper to summarise some of the more important examples of "Flies and Disease."

In animals and men flies act as:—

(*a*) Parasites—both internal and external; and
(*b*) Carriers of disease—directly or indirectly.

(I) *Flies affecting Live Stock.*—As parasites, flies affect animals more than man. Domestic animals, *e.g.*, horses, cattle, sheep, camels, etc., and many kinds of wild animals are liable to be attacked by the larvae of Bot and Warble flies (*Oestridae*), of which family nine species, belonging to nine genera, are found in Britain, each affecting a different host. In contradistinction to the blood-sucking diptera these flies have their mouth-parts atrophied in nearly all cases in their perfect state; their life as imagines is quite short in proportion to their larval existence, and it is perhaps in some measure due to this fact that, with the exception of the horse bot-fly, they are rarely met with in this stage. [1]

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[1] The imagines of Warble Flies have been recorded as occurring on boulders on the summits of hills and mountains. ("E.M.M.," March, 1900.)

The method of attack varies: the straw-coloured, spindle-shaped eggs of the horse bot-fly, *Gastrophilus equi*, F., are laid on the ends of the hairs of the coat in parts accessible to the animal's tongue; the combination of moisture, warmth and friction due to the licking or rubbing of the lips on that part of the coat where they are laid, causes the caps of the eggs to break off, and the young larvae adhere to the rough surface of the tongue and mouth, whence they eventually find their way, it is not known exactly by what means, to the stomach of their host. There they feed on the mucus and secretions for some nine to ten months, and when full-grown pass out through the intestines and are dropped with the excreta. They pupate in the earth. Authorities differ as to the amount of harm caused to horses by the bot-fly larvae, but it is obvious that their presence in large numbers must be detrimental to the general health of the animals.

The eggs of the ox warble-fly, *Hypoderma bovis*, Dog., are also laid on the coats of their hosts, usually in the neighbourhood of the fetlocks and heels. The newly hatched larvae burrow into the skin and pass, presumably through the tissues, to the gullet, where they stay for a considerable time. In their final stages they form large tumours along the backs of the affected animals, under the skin, which they perforate when full fed, passing out and pupating in the ground. Thus, in addition to the injury to the health of the living animals, they spoil both the commercial value of the hides and also that of the meat of the carcases, as a considerable portion in the neighbourhood of the warbles is unfit for use and has to be cut away. Miss Ormerod has estimated the cost of the annual damage caused by these flies in Great Britain and Ireland at over £2,000,000, and Hadwen states that in Canada 20 to 30 per cent of the hides are damaged by this pest. The domesticated reindeer and various kinds of wild deer are also liable to the attacks of warble-flies, whose habits are similar to those of the ox-warble.

Two bot-flies, *Oestrus ovis*, L., and *Cephenomyia rufibarbis*, Mg., attacking respectively sheep and red deer, differ from the above described species as they are viviparous, the females depositing larvae in the nostrils of their victims, whence they penetrate to the cavities of the head in the sheep and to the back of the throat of the red deer. The full grown larvae are ejected from the nostrils and mouth, and pupate in the earth in the usual way.

Lucilia sericata, Mg., another fly that is parasitic on sheep, is a member of the "bluebottle" family. This is not an internal parasite; the female lays eggs on the wool near the rump, and the larvae develop and live at first externally on the wool, but later penetrate to the flesh, causing great discomfort to their hosts, as the "blown" wool of an attacked animal attracts other flies, which add their quota of eggs to those previously deposited, with the result that the unhappy victim, if not attended to, has to support an ever increasing number of larvae in all stages of growth. Pupation is in the earth.

The normal habits of the "bluebottle" group are well known. They act as scavengers, their eggs being laid in decaying and dead vegetable or animal matter, but recent evidence seems to show that this parasitic habit of attacking live stock is spreading in Britain.([2]) *L. sericata* is well known as a pest on parts of the Continent, but the most harmful cases occur in the Antipodes, where the damage to the sheep-raising industry caused by the attacks of two allied species, *Calliphora villosa** and *C. rufifacies**, was estimated in 1912 as over £1,000,000, both in New South Wales and in Queensland. Froggart, in his reports on this pest in the former colony states that forty years ago the flies themselves were not noticeably common and only isolated cases were known of sheep being attacked, but in recent years they have increased tremendously in numbers, and their control has become a most serious problem to stock owners. Froggatt attributes this abnormal increase in part to the destruction of birds and insectivorous animals through poison laid down to get rid of rabbits, and in part to the periodic droughts. The latter caused a great shifting of flocks to different parts of the country, and those migrations left numbers of dead along their routes. The "bluebottles" were attracted by the carcases, and thus, he considers, acquired the habit of laying their eggs on wool. New Zealand also suffers from this pest, but here it is our British species *L. sericata* that is responsible. In quite a different quarter of the globe, Hawaii, another species of "bluebottle" has developed similar parasitic habits in recent years.

Other diptera which may be considered as external parasites belong to the sub-order Pupipara. These flies are viviparous, both the ova and larvae pass their existence in the female and are deposited singly in the form of full fed larvae, which at once proceed to pupate. The species of this sub-order are bloodsuckers, but apparently cause more irritation and annoyance to their hosts by their habit of crawling about the tender parts of the skin than by their bites. The adults have flattened horny or leathery bodies, and their legs have very well developed claws. Many species are wingless, or shed their wings shortly after emergence. The best known example in this country is the "Forest Fly," *Hippobosca equina*, L., which causes great irritation and fright to horses strange to the districts in which it occurs. The New Forest ponies being acclimatised do not suffer to anything like the same degree as do animals brought there from other parts. In foreign countries species of *Hippobosca* are found on donkeys, mules, cattle, and camels. In

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([2]) Macdougall in "Transactions of Highland Agricultural Society," 1909.
* Now known as *Neopollenia stygia* and *Chrysomyia albiceps*.

South Africa two species are *suspected* of carrying a protozoal blood parasite of cattle. Another well known member of the Pupipara is the so called "sheep-tick" or "Ked," *Melophagus ovinus*, L. As is implied by its popular name this parasite bears but little resemblance to a fly, being a small wingless insect that spends all its stages in the wool of sheep, obtaining nourishment from the blood of its host and the grease present in the wool. It is I believe rather an annoyance than a serious pest. Other species of the Pupipara are parasitic on birds, bats, and bees.

A fly of world wide distribution, *Lyperosia irritans*, L., belonging to the *Muscidae*, is known as the "Horn-fly" from its habit of clustering in masses on the horns of cattle. It is about half the size of a house-fly, a bloodsucker, and by some authorities supposed to be a carrier of "surra" disease. It is not uncommon in England, but not harmful here, though in America it is said to have caused injury to livestock.

(II) *Flies affecting Man.*—External dipterous parasites of man are rare as compared with those of animals. This is only what might be expected, as apart from his superior intelligence, man by the free position of his arms is far more able than animals to ward off the attacks of a fly desirous of depositing ova or larvae on his person. Such attacks are usually confined to the inhabitants of the tropics or uncivilised regions, and infants are more liable to them than adults. From time to time the presence of fly larvae in the living human body causes the disease known as Myiasis. In this country the larvae are usually those of the common Anthomyiid flies, *Fannia scalaris*, F., and *F. canicularis*, L., and are generally voided while still in the larval stages. It is not known with certainty how persons become infected. Rare cases have been recorded of the presence of warble-fly larvae in the human body. Myiasis is also caused by the presence of the larvae of bluebottles, *Muscidae*, and flesh-flies, *Sarcophagidae*, in open sores or neglected wounds. In Cuba, Brazil, and other parts of tropical America, a fly known as the screw worm, *Chrysomyia macellaria*, deposits its larvae in the nostrils or ears of persons sleeping in the open—especially when offensive discharges are present—the larvae develop in the tissues and cause bad sores, and in some cases where they have reached the brain the results have been fatal. In the tropical parts of America, and in Trinidad, the larvae of yet another fly, *Dermatobia cyaniventris*, cause cases of Myiasis. In Africa, that home of insect pests, the larvae of the Tumbu-fly, *Cordylobia anthropophaga*, frequently penetrate under the skin and give rise to a form of Myiasis. Infants are more often attacked than adults. The eggs of the fly have been found deposited on flannel and woollen clothing hung out to dry. Dogs, monkeys, and rats, are also liable to its attacks. The larvae of a Muscid fly, known as the "Congo floor-maggot." *Auchmero-*

myia luteola, is bloodsucking, attacking persons sleeping on the floor in dirty huts. This is the only case recorded so far of the bloodsucking habit occurring in the larval stage of a dipteron.

Part II.—*Read January 8th*, 1925.

The foregoing examples of flies and disease have dealt with cases where the insects themselves are the parasites, and animals more affected than man; we now turn to those where the flies are not themselves parasitic, but act as carriers of other diseases, and where man is more affected than animals. Our knowledge of these fly-borne diseases is comparatively recent, but has increased very greatly in a short period of time; and this increase is mainly due to the equally rapid progress on the medical side in the knowledge and study of blood parasites; for although the diseases themselves have been recognised for generations, their causal agents, both direct and indirect, have only been discovered, in the majority of cases, during the lifetime of many of those present. For example, in Volume VI. of the "Cambridge Natural History," published in 1899, the late Dr. Sharp says, "there is good reason for supposing that mosquitoes may act as disseminators of disease, but there is no certain evidence on the subject"; and on the medical side, it was not until 1901 that the micro-organism causing sleeping-sickness was recognised, and not until 1903 that it was definitely connected with its dipterous host.

The disease-carrying diptera can be sub-divided into two classes, blood-sucking and non-bloodsucking; the former acting as direct, and the latter as indirect carriers. The bloodsucking flies are peculiar in this respect, that the habit is irregular and not confined to any one section of the order; this was pointed out by Dr. Sharp, who in the above mentioned work gives the following distribution:—

Orthorrhapha.

Nemocera ...	Five out of twelve families are bloodsuckers.
Brachycera ...	Two out of fifteen families are bloodsuckers.

Cyclorrhapha.

Aschiza ...	None.
Schizophora...	One out of seven families is a bloodsucker
Pupipara ...	All four families are bloodsuckers.

In most cases the habit is confined to the female sex only, but in some both male and female are bloodsuckers. It does not occur, as might perhaps have been expected, in those families whose species are predacious on other insects. So far as I know only one other order, the Hemiptera (Bugs), has this habit restricted in like manner. In this order only two families ([3]) out of twenty-five are bloodsuckers. In the remaining bloodsucking orders Aphaniptera (fleas), and Anoplura (lice), the habit is universal.

To return to our immediate subject, we find that blood parasites can be carried, either externally on the proboscis of the bloodsucker, from one victim to another, or inoculated internally by an already infected carrier into the blood of the man or animal attacked. External transmission is rare, for the parasites cannot stand exposure for any length of time, and if infection is to be successful, opportunity must be offered for the carrier to be able to bite several victims in rapid succession. In two tropical diseases of animals—or perhaps two forms of one disease—"El debab" affecting camels in Northern Africa, and "Surra" affecting gregarious animals in India and the East, the parasites are carried externally by Tabanid bloodsucking flies.

In the case of internal transmission, the parasite is inoculated by an already infected carrier into the blood of the man or animal attacked, and undergoes a dual development, passing certain phases of its life-history in the body of its invertebrate, and others in its vertebrate host. The more important diseases affecting man—malaria, yellow fever, dengue, filariasis, sandfly fever, and sleeping sickness are due to internal transmission; the first four by means of mosquitoes, the fifth by a Psychodid and the last by Muscid flies.

Malaria.—Malaria is the most frequent and wide-spread of insect-borne diseases, and up to recent years the cause of more deaths than any others, as by reason of the vast numbers attacked the fatal cases exceed those of more deadly but more restricted diseases. Sir Ronald Ross has suggested that the decline of ancient Greece was due to the gradual spread of malaria introduced from the East, and in modern times the West Coast of Africa well-deserved its name of the "White Man's Grave," until those anti-mosquito measures were taken, which have made it no more to be dreaded than any other tropical residence. Even nowadays the death roll of malaria is heavy, and to quote Sir R. Ross again, ([4]) is responsible for an annual death roll estimated at 700,000, apart from India, which has an even higher annual mortality.

The parasite of malaria in man is only carried by one group of mosquitoes, the *Anopheles*—(harmful).([5]) Their life-history in no way differs from that of other mosquitoes. The eggs, varying in number in different species from 40-100, are laid close to, or in water, and both larval and pupal states are aquatic, the pupae being

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([3]) The ***Reduviidae*** and the ***Cimicidae***.

([4]) "The Times," 5.4.24.

([5]) Birds as well as man are liable to malaria, but in their case a *Culex*, and not an *Anopheles*, is the carrier.

as active as the larvae. Breathing takes place in the larvae by means of a respiratory apparatus situated in the tail, and in the pupae by means of two tubes on the thorax. The abundance or otherwise of food and the state of the temperature have considerable influence on the duration of the larval and pupal stages. Different species of Anopheline mosquitoes have very different breeding grounds; stagnant pools are favoured by some, running streams by others. Salt marshes and the water-containing receptacles of pitcher-plants are two more contrasting examples of their variability in this respect. Speaking generally they are country rather than town insects, but one Indian species was found to be breeding freely in wells and cisterns in the heart of Bombay, although its usual breeding-grounds were pools and hoof-marks in the beds of sandy rivers. Of our three British species, two (*A. maculipennis*, Mg., and *A. bifurcatus*, Mg.), breed in open stagnant water; the third (*A. plumbeus*) only in water-holes in trees. The adult Anophelines, in addition to structural differences, can be distinguished by their resting position from the Culicines, the other main group of mosquitoes, as the latter settle with their body parallel to the surface of their support, whereas the Anophelines rest with their heads and bodies in line in a slanting position. The larvae of Anophelines rest horizontally at the surface of the water, but the Culicid larvae hang head downwards in a perpendicular position, and have a more or less elongated respiratory tube, which is absent in Anophelines.

Malaria is caused by certain protozoal parasites of the red blood corpuscles, known as "plasmodia." The development of the three forms known to occur in man is essentially similar, but the period of their life-cycle varies, giving rise to the so called tertian and quartan fevers. These plasmodia develop both as a-sexual and sexual forms, the former concerned with the production of fever, the latter only of importance if ingested by a mosquito, as they require a further period of existence in the internal organs of the insect, lasting normally about eight days, for their complete development. An important fact, however, in the sexual cycle is that, what we may term the early female form, has been found to be capable of remaining latent for long periods in the body of its vertebrate host, and under stress of low vitality due to over exposure or sudden chill, becoming active again and capable of starting fresh cycles of both sexual and a-sexual forms, without need of fresh insect infection. Outbreaks of malaria, which would otherwise be unaccounted for, may probably be put down to this fact of latent malaria.

Since the first great discovery of the malarial connection between mosquitoes and man, due to the patient toil of Sir Ronald Ross in the face of official indifference and discouragement, many interesting facts have come to light. It has been found that mosquitoes are very susceptible to temperature in all their stages, and that they settle by preference on dark rather than light surfaces, and that in the case of yellow fever the mosquitoes require a meal of blood before oviposition. It has also been found that the native population of a malarious district, though themselves immune, may yet act as reservoirs of infection and thus keep the disease alive. An analogous instance was observed by Koch, in New Guinea, where he noted that Chinese immigrant coolies, after a residence of some years, suffered comparatively slightly from malaria, but that a recrudescence of the disease usually followed the arrival of any considerable number of fresh immigrants. Economic influences have been shown to have a great deal to do with the prevalence or otherwise of malaria, poverty-stricken districts being usually more infectious than prosperous ones, and malaria becoming more prevalent after famines, etc. The problem of malaria has been stated by one observer as malaria parasite + anopheles + man + X, and the more that can be found out about X, the greater are the possibilities of fighting this wide spread and devastating insect-borne disease.

Yellow Fever.—In strong contrast to malaria, which is carried by numerous Anophelines, yellow fever is conveyed by one species only, *Stegomyia fasciata* (now known as *Aedes argenteus*), which belongs to a different group, the *Culicinae*. By reason of its banded coloration it is known colloquially as the "Tiger mosquito" and, again in contrast to the Anophelines, is essentially domestic in its habits, breeding in cisterns, water-butts, broken bottles, old tins, or any receptacle capable of holding water. Its early life-history is similar to that of other mosquitoes and lasts normally from fifteen to twenty days; but it is remarkable in one important respect, namely, that its eggs, though laid in water, can retain their vitality in cases of evaporation. They have been kept dry for over three months and when replaced in water have hatched out and developed successfully into imagines. The Tiger mosquito is very susceptible to temperature and humidity, and is essentially a tropical insect, mainly confined to sea coasts and the banks of rivers. It is long-lived in the adult stage, females having been kept in captivity for over four months; and this lengthy vitality, added to its propensity for settling in houses, sheds, etc., is an important factor in the spread of yellow fever, as it was undoubtedly carried from one port to another in the old wooden sailing vessels.

The exact nature of the causal parasite is I believe still uncertain, but it is generally supposed to be an extremely minute protozoal organism known as a spirochaete.(6) Its life-history is certainly different from that of the plasmodia of malaria, as is shown by an experiment by certain French investigators, who took mosquitoes that had been fed on the blood of an infected patient, and after twelve

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(6) *Leptospira icteroides* ("Tropical Health").

days—the time usually required for the incubation of the parasite in the insect, ground them up into a paste with syrup, and found that freshly hatched specimens when fed on this syrup become themselves infected. It was also experimentally proved by the same investigators, that an infected insect could transmit the infection to the next generation. (7)

Yellow fever, as stated above, is a tropical disease endemic in parts of Central and South America, and since about 1780 in West Africa, to which country it is believed to have been carried in ships; it has occasionally occurred in epidemic form in Southern Europe, and even in this country: an outbreak being recorded at Swansea in 1865. It is a very deadly disease. It caused the first attempt to cut the Panama Canal to end in failure, and used periodically to decimate the population of Havana, New Orleans and other towns in the tropical parts of America, but once its cause was discovered (in 1899), the domestic habits and breeding places of the carrier have enabled anti-mosquito measures to be applied much more effectually than in the case of malaria. The second attempt to cut the Panama Canal is a classic example of a successfully conducted anti-mosquito campaign, and this dread disease, known to the ancient Aztecs and their Spanish conquerors, and celebrated in Marryat's and other novels as "Yellow Jack," is now being rapidly stamped out.

Dengue Fever.—Besides being responsible for yellow fever, the Tiger mosquito is supposed by some authorities to be the carrier of "dengue fever," a disease occurring in the warmer quarters of the globe, and prevalent in parts of Australia, non-fatal, but of considerable economic importance owing to its wide range and high incidence. The causal parasite is not definitely known, but both *Stegomyia fasciata* (*A. argenteus*) and *Culex fatigans*, another Culicine mosquito, have been accused as carriers. *C. fatigans* has been *experimentally* proved to be capable of carrying the infection, and it is interesting to note, that the known range of this mosquito coincides to a remarkable degree with the areas in which the disease occurs. It is also noteworthy to observe that Port Said, which had been subject to severe epidemics, and where this was one of the most common species, was freed, as a result of a vigorous anti-mosquito campaign, from dengue fever, though it is still prevalent in other parts of Egypt.

Elephantiasis.—There is yet another mosquito-carried disease and that is Elephantiasis, a repulsive form of a group of diseases known collectively as Filariasis, of which the causal agents are minute

(7) "Ann. Institut Pasteur," Vol. XVII., pp. 665-751.

parasitic worms (*Filariae*). In Filariasis the adult organisms in the vertebrate host reproduce embryonic worms, enclosed in a transparent sheath, but capable of movement. These make their way into the blood-vessels of their host, but are incapable of further development until ingested by a mosquito, when they undergo further stages of development and, when full grown, find their way to the proboscis of the insect, where they remain until it feeds on some vertebrate host, and then penetrate through the pores of the skin, if sufficiently moist. Once within the vertebrate host they develop into adult Filariae and the life cycle restarts. Elephantiasis is a widespread tropical disease and, as is implied by the name, causes extensive swellings of parts of the body, especially the legs, which sometimes attain an enormous size; it affects old and young alike, and no effective treatment is known. The Filariae have been observed in several species of mosquitoes, among others in *Culex pipiens* (in China), *C. fatigans* (in the West Indies and Australia), and various Anophelines in India and West Africa. It is an interesting fact that the presence of Filariae has a deleterious effect on the mosquitoes, and is frequently fatal to them. Other forms of Filariasis are conveyed to man in other ways. "Loa Loa" or "Calabar swellings" are conveyed by two species of Tabanid bloodsucking flies (*Chrysops*),(8) of which genus we have four representatives in this country. Yet another form of Filariasis is known as "guinea worm," and in this case the invertebrate host is not an insect at all, but a minute crustacean, a cyclops which infects man by being swallowed in unfiltered water. Owing to these various forms of infection and the fact that in some cases the insect infection of Elephantiasis seems doubtful, it has been suggested that this mosquito-borne infection is a recent development, and other authorities suggest that the disease is caused by bacilli and not by filariae, but the balance of evidence tends to the mosquitoes being the main carriers, and justifies this disease being included in this paper on flies and disease.

Sandfly Fever.—One more disease, "Phlebotomus" or "Sandfly fever," is carried by a small fly, not a mosquito, but belonging to the same great division of the Diptera, the Nematocera. It is non-fatal, but painful, and being epidemic affects large numbers at the same time. It occurs in tropical and sub-tropical countries. The causal agent is believed to be a spirochaete allied to that of yellow fever, and it is carried by the blood-sucking midge *Phlebotomus papatasii*, closely allied to the owl-midges, minute flies with heavily scaled wings, often seen on our windows. It is so small that it can easily pass through the meshes of an ordinary mosquito

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(8) *Chrysops dimidiata* and *C. silacea.*

net. The virus is carried on from generation to generation of the insect, by means of the grubs feeding on the dejecta or dead remains of the parents.

We now come to the last of the diseases caused through the internal inoculation of a parasite by means of a bloodsucking fly.

Sleeping Sickness.—Sleeping sickness—not to be confounded with the "Sleepy sickness" which occurs in this country—vies with malaria and yellow fever in its mortality, but unlike those diseases, is confined to one portion of the globe, *viz.*:—Tropical Africa,[9] where it has been known as a specific disease for some 200 years.[10] It was for long confined to West Africa and did not attract wide spread attention; but when Equatorial Africa was gradually opened up by the advance of civilisation, the disease was carried to Central Africa and the regions of the Great Lakes (it is believed in the wake of Stanley's historical expedition for the relief of Emin Pasha). Here it found virgin soil and spread with startling rapidity and appalling results. In 1901 a great epidemic of sleeping sickness occurred in Uganda. Eight cases of a mysterious disease were reported in July of that year; and six months later thousands of cases and over two hundred deaths occurred. With the spread of the disease whole villages became depopulated, and great tracts of highly cultivated country relapsed into scrub and forest; and in 1906 the Governor of Uganda stated in an official report that, "during the last five years the total mortality from this scourge in the Protectorate has considerably exceeded 200,000." The Government took prompt steps to cope with this state of affairs. In 1902 a Royal Society Commission was sent to Uganda, and in April, 1903, Colonel Sir David Bruce was able to announce the discovery of the causal agent of the disease, "a trypanosome,"[11] and of its carrier, a "Tse-Tse" fly, *Glossina palpalis*. This discovery and the fortunately limited areas of distribution of the fly, enabled the authorities to take energetic measures of segregation and the removal of the whole of the inhabitants from infected islands in the Lakes; and though such steps were carried through with great difficulty, owing to the reluctance of the natives to leave their homes, and their inability to appreciate the necessity of these drastic measures, the result was that the disease was checked and there is now a greatly diminished annual death roll, though the disease is still prevalent in parts of French and Belgian Congo. In Uganda, from 1905 to 1917, there were some 30,000 deaths, compared with the 200,000 in

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(9) Fossil flies allied to *Glossina* have been found in Colorado, U.S.A.

(10) An interesting and quaintly worded account of sleeping sickness occurs in the "Journal of a Naval Surgeon," published in 1742, quoted by Dr. Carpenter in his "Naturalist on Lake Victoria."

(11) See p. 19.

the preceding five years. In 1909 cases of sleeping sickness were observed in Nyassaland, and here the carrier was found to be another *Glossina*, *G. morsitans*, which is also the carrier of "Nagana" in domestic animals, for, in addition to being the carriers of sleeping sickness in man, Tse-Tse flies are responsible for various forms of Trypanosomiasis in domestic animals, and their presence has hindered or stopped the agricultural development of large areas of fertile land. The journals of the early African explorers contain frequent references to the "fly" whose bite was fatal to their transport animals. The two most widely spread of these animal diseases are known as "nagana," occurring in Central and Eastern Africa, and carried by *Glossina morsitans*, and "Baleri," occurring in Western Africa, carried by *G. longipalpis*. Several other forms of disease due to the inoculation of trypanosomes by Tse-Tse flies occur in other parts of Africa.

The genus *Glossina* is very anomalous. Morphologically, in wing venation and general external structure, it belongs to the great group of Muscid flies with which it is classified; but biologically, in its method of reproduction and the structure of its larvae, it resembles the Pupipara; while bionomically, in its habits it is a blood-sucker, with this difference from the majority of blood-sucking flies, that the habit is not confined to one sex only, but extends to both males and females. A Tse-Tse fly has a superficial resemblance to our British *Stomoxys calcitrans*, also a muscid blood-sucker, but it differs in the position of the wings at rest. In the Tse-Tses these overlap each other like scissor blades, whereas in *Stomoxys* they rest parallel and do not overlap at all. At the present time sixteen species of *Glossina* have been recognised in Africa, (12) and eight are known to be capable of infecting man and (or) domestic animals. In their book on Tse-Tse flies, Austen and Hegh divide them into four groups, of which group I, with *Glossina palpalis* and allied species, are responsible for most of the outbreaks of sleeping sickness in West and Central Africa, and *G. morsitans* and its allied species (Group II) are the principal carriers in Nyassaland and Rhodesia.

The earlier stages in the life-history of Tse-Tse flies are passed in the bodies of the females, which produce one fully grown larva at a time, and this larva immediately proceeds to pupate in the earth.(13) The duration of the pupal period varies according to climatic and meteorological conditions, from three weeks to two months. The adults live certainly for several months, but as in the case of the pupae, their life varies with the wet and dry seasons, and they are scarcer in the latter. They are very susceptible to temperature and

(12) One in Southern Arabia, outside Africa geographically but in the same zoographical region.

(13) The life-history of our British *Hippobosca equina*, the Forest-fly belonging to the Pupipara.

humidity, both as regards their abundance and reproductive activity. Their favourite breeding places are under the shelter of fallen trees and logs; shade and an easily penetrated soil being the main requisites. The flies do not occur promiscuously over whole districts, but are confined to more or less closely defined areas, called fly-belts, and even if they follow some traveller or animal out of these belts, there is experimental evidence that they return to their chosen localities. In some cases there are seasonal migrations. Being blood-suckers they are usually to be met with in the neighbourhood of the game-paths traversing their "belts," but the localities affected vary in the cases of different species, except that a shady base appears to be essential. They are specially attracted by moving objects, and have been noticed to accompany men or animals for several miles. They show a preference for dark-coloured surfaces on which to rest, *e.g.*, a dark-coloured animal will be attacked more frequently than a light-coloured one.(14) When a collection of flies is made at any given spot it is almost invariably found that males predominate to a large extent. This is explained by the fact that the males are more active and curious than the females, which are sluggish and inactive as a rule, unless pressed by hunger. If, contrary to usual experience, the percentage of females taken at a given spot is large, there is reason to suppose that the natural hosts are scarce, and in consequence man is more likely to be bitten by the hungry flies and more likely to be infected with disease.

In this connection Fiske states: "Perhaps the most important point in this connection is, that the chances favouring transmission of the virus of sleeping sickness from man to man are vastly less proportionately, when few flies feed on man than when many do so. The same fly must feed on or bite the human host twice in order to transmit disease from an infected to a healthy man. If only one fly in 500 or 1,000 actually bites man, the chances that the same fly will attack man a second time are absurdly small, if every second or third fly feeds on or bites man, the chances that the same fly will attack man a second time are stupendous in comparison."(15)

Very few natural enemies of the Tse-tse fly are known. The viviparous habit of the genus greatly reduces the opportunities of parasitic insects, but about a dozen species of hymenopterous, and two dipterous parasites have been bred from pupae. Various species of spiders have been noticed to capture *G. palpalis.* Dragon-flies have been seen preying on the adults and Predaceous wasps of the genus *Bembex* feed their grubs on *Glossina*: but the *Asilidae,* the well known group of predaceous diptera, have not so far been noted as

(14) Experiments with *G. morsitans*, made by Professor Newstead in Nyassaland in 1911, showed that khaki colour was more attractive. ("Austen and Hegh," p. 40.")

(15) Tse-Tse Flies ("Austen and Hegh," p. 181

capturing Tse-Tse. The bush and undergrowth frequented by the flies probably hinders their capture by insectivorous birds, and they do not seem to be much affected by these enemies of insect life.

The causal agent of sleeping sickness is a microscopic blood parasite known as a "trypanosome," belonging to the lowest order of animal life, the Protozoa. Trypanosomes occur in the blood of most living creatures, including insects and other invertebrates. In the blood of their vertebrate hosts they multiply a-sexually by fission, but in the invertebrate host they undergo a sexual form of reproduction. Most of them appear to be harmless, but a certain number have been found to be the cause of disease both in man and beasts. The danger of these pathogenic trypanosomes lies in the fact that they can live harmlessly in the blood of some hosts, but when transferred to others they cause disease. There is evidence that after a long period of time a degree of immunity is attained, *e.g.*, the species of trypanosome known as *Trypanosoma nigeriense*, the causal agent of the West African form of sleeping sickness, which has been known to medical science for at least 200 years, and probably existed long before, is not nearly so virulent as *T. gambiense*, the trypanosome of the Uganda form of the disease. The medical knowledge of trypanosomes is, however, not sufficiently advanced to declare with definite authority on all the various forms that are known.

The discovery, that in many cases wild animals act as reservoirs of harmful trypanosomes, has led to much controversy as to the desirability or otherwise of their destruction. Many authorities hold that there is a vital association between the prevalence of big game and the continuance and increase of Tse-Tse flies, and that if the game be destroyed or driven away from the fly-infested areas the Tse-Tse would also disappear. This hypothesis is supported by the fact that immediately after the rinderpest epidemic of 1896, which killed off the big game, the fly also disappeared from large tracts of land in Rhodesia, where it had previously been prevalent, and that subsequently with the return and increase of game the fly again became in evidence. Other authorities, however, hold that this hypothesis is not proved. They point out that the disappearance of the fly after the rinderpest may have been merely a coincidence, and dependent on climatic or other influences; also that the large mammals vary in relation to the different species of *Glossina*, and the fact that in laboratory experiments a particular species of animal can infect flies, does not prove that it always does so under natural conditions. It is also pointed out that in many cases it is probable that smaller animals, such as the bush pigs, are responsible for the infection, and further, that the destruction of their natural hosts would lead to intensified attacks by the flies on man and his domestic animals. Again, it would be almost, if not quite, impossible to exterminate the game over large areas of country, and even supposing this could be done, the fly could still exist on other hosts: for example, in the district of the Victoria Nyanza, it has been found that the main reservoir of the sleeping sickness trypanosome is the marsh frequenting Situnga antelope, but the flies also feed on the blood of crocodiles and lizards, and have been found experimentally to prefer their blood to that of mammals, and on certain islands, where these Situnga antelopes have been destroyed, the Tse-Tses have continued to exist in undiminished numbers. There is one case on record where the fly has been exterminated, but this was in an exceptionally isolated area, the island of Principo off the West coast of Africa. As the nearest point of the mainland was 125 miles distant, there was no possibility here of its reinforcement or reintroduction by natural means. In 1912-13 the Portuguese authorities in this island carried out an intensive campaign against *Glossina palpalis*, which had been introduced about 1890. Marshes were drained, woods that might shelter the flies were cut down, the wild pigs, civet cats, and stray dogs destroyed, and all domestic animals suffering from trypanosomiasis were slaughtered. The labourers working on the plantations were served out with black waist cloths smeared with bird lime, which proved effective fly-traps. At the commencement of the campaign in August, 1912, these living fly-traps proved most effective, in one plantation employing seven men, with bird limed cloths, 9,000 to 10,000 per month were caught; by November, 1913, the monthly total had fallen to 300, although 22 men were employed, and by April, 1914, a reward of 5 escudos (about 15s.) per fly failed to produce any. Such measures, it will easily be realised, would be impossible on the mainland, and in our present state of knowledge the balance of evidence seems to be against the big game destruction hypothesis. Further study of the life-histories and habits of the flies, the possibility of the use of natural enemies, parasitic or otherwise, and unremitting use of all possible preventive methods, such as destruction of likely breeding places, may do something to diminish gradually this insect scourge of Africa.

Part III.

The foregoing paragraphs are, I fear, an inadequate summary of one of the most important and interesting cases of the association of flies and disease, and I have left myself but little time for the final class of flies and disease, namely, those cases where the insects act as indirect carriers of external parasites. Here we cease to have to do with the protozoal parasites and come to microbes and bacteria, and also no longer need to go to tropical regions for illustrations, but find material in our own homes, for the common house-fly is one of the most notorious examples of a dipterous carrier of bacterial disease. Fortunately, for the sake of my audience, I need not dwell long on this section, as there are numerous easily available and cheap books and pamphlets dealing with the subject; and I will endeavour to summarise as briefly as possible. House-flies by their structure, habits of feeding, and numbers, are admirably fitted to be carriers of disease. They are equally attracted by any kind of filth and carrion, and by human food, the hairs and bristles on the body and legs of the fly act most effectively as germ carriers, its personal habits of cleanliness transfer these to its foot pads, and as it crawls over our milk jugs, bread, sugar, etc., it leaves deposits of germs. Not only does it carry germs externally, but it also retains in its intestine for some considerable time (two or three days in experiments) other germs it may have sucked up when feeding on objectionable objects, and when feeding on dry substances such as sugar it has the habit of regurgitating part of the contents of its crop, with the double effect of moistening the food for its own delectation, and depositing germs for subsequent human infection. In this way bacteria, that would otherwise have perished by exposure on the legs, etc., can be conveyed to food. This carriage of disease germs has been frequently proved experimentally. I will give one example. Three flies caught at Norwood in 1908, one in a house, one in a dustbin, and one out of doors, were made to walk over a glass slide prepared with a mixture for the cultivation of bacteria, and the results were as follows:—

From the indoor fly 25 colonies of bacteria and 6 of fungi were obtained; from the dustbin fly 116 of bacteria and 10 of fungi: and from the outdoor fly 46 of bacteria and 6 of fungi. The principal diseases associated with house-flies are typhoid, or enteric fever, and cholera, especially in cases where large numbers of persons are gathered together with inadequate sanitary conditions, such as armies, and in the East the great assemblies of religious pilgrims; infantile diarrhoea, in slum areas of large cities; ophthalmia, especially in the East; and, more doubtfully, plague and diptheria. House-flies also act as carriers of parasitic worms. The only point in their favour is that most of the evidence against them is experimental and circumstantial, as direct evidence is difficult to obtain and needs very careful and expert examination, especially on the medical side, identification, and culture of bacteria, etc., but the mass of circumstantial evidence is overwhelming. Blue-bottles and blow-flies, in addition to their habits in relation to meat, have been proved experimentally to be carriers of bacteria, but are not such persevering house-frequenters as house-flies. For further details I would refer you to some of the works enumerated in an appendix to this paper, and will conclude this section by expressing the belief, that with the advance of sanitary knowledge our great grandchildren will be astonished at their ancestors' tolerance of house-flies in their homes, and the action of municipal authorities in allowing large refuse heaps to be dumped and left, without taking measures to have them disinfected, and thus turned into fly-traps instead of simply supplying breeding places on a large scale for these disease carrying insects, as is too often the case at present.

I have only a few final remarks to make. You will doubtless have noticed that I have said very little in this paper about remedies or preventive measures. I have purposely refrained from doing so for two reasons; firstly my object has been to draw attention to the importance of flies themselves from the point of view of medico-economic entomology, and secondly, I am not in the least qualified to give an essay on the diseases of which they are the direct or indirect causes. Those who are interested in this side of the question will find full details in many works on the subject, of which I mention a few in a short bibliography. I wish to interest more of the members of this Society, especially the younger members, in this very interesting order of insects, which is so neglected by most entomologists. Thirteen years ago (in 1909) I read a paper on Diptera to the Society, treating the subject from a general point of view. In the Proceedings for that year the list of members showed some half dozen denoted as being especially interested in this Order. In last year's Proceedings the number is still only six—out of a total of over 200. I would appeal to our younger members to take up the study of this group. I consider, with all due deference to my fellow members, that far too many are devoted to the lepidoptera and far too few to the "neglected" orders, of which the Diptera are perhaps the most neglected of all.

In conclusion I must thank various friends for their help in preparing this paper, especially Mr. Harwood and Dr. Marshall for specimens, Professor Maxwell Lefroy and Dr. S. Monckton Copeman for the loan of lantern slides. I am much indebted to the Imperial Bureau of Entomology for the loan of books, and to all of you for the patience with which you have listened to me.

APPENDIX.

Bibliography.

Ormerod, E. A. ... ... Flies injurious to Stock (1900).
Hedwin, S. ... ... Warble Flies (Dept. of Agriculture, Canada, 1919).
" ... ... Flies affecting Live Stock (do. 1923).
Macdougall, R. S. ... Sheep Maggots and related flies (Trans. Highland Agricultural Socy., 1909).
Froggatt, F.L.S.... ... Sheep Maggot Flies (N. S. Wales Govt. Reports, 1922).

*Graham Smith	Flies and Disease : I. Non-Bloodsucking Flies, 1914. II. Bloodsucking Flies, 1914.
Edward Hindle	
*Ealand	Insects and Man.
*Patton and Craig... ...	Medical Entomology.
Tropical Health	A pamphlet published by the British Govt. Section, Wembley Exhibition, 1924.
Carpenter, Dr. H. ...	A Naturalist on Lake Victoria.
*Austen and Hegh ...	Tse-Tse Flies.
Maxwell Lefroy, Professor	The Housefly Campaign, 1915.
Hewitt	House-flies and how they spread disease, 1912.
Plowman and Dearden ...	Fighting the Fly Peril, 1915.
Hardy, G. H.	The Book of the Fly, 1915.
Austen, E. E.	The Housefly as a Danger to Health. (B. M. Economic Series.)
Local Government Board.	Reports on Flies as Carriers of Infection, nos. 5-7.

* These Works have extensive Bibliographies.

Explanation of Plate V.

Seasonal Variation in Rhopalocera.—Pieridae.

Upper half.

Pieris napi.

Top Pair : ♂ and ♀ of single-brooded alpine, and extreme northern, race *bryoniae.*

Second Pair : Spring brood of North Europe (Germany, N. France, etc.), *napi.*

Third Pair : Summer brood in same latitudes as second pair ; equivalent to spring brood in more southern latitudes, *napaeae.*

Fourth Pair : Summer brood in South Europe, Near East, etc., *pseudorapae.*

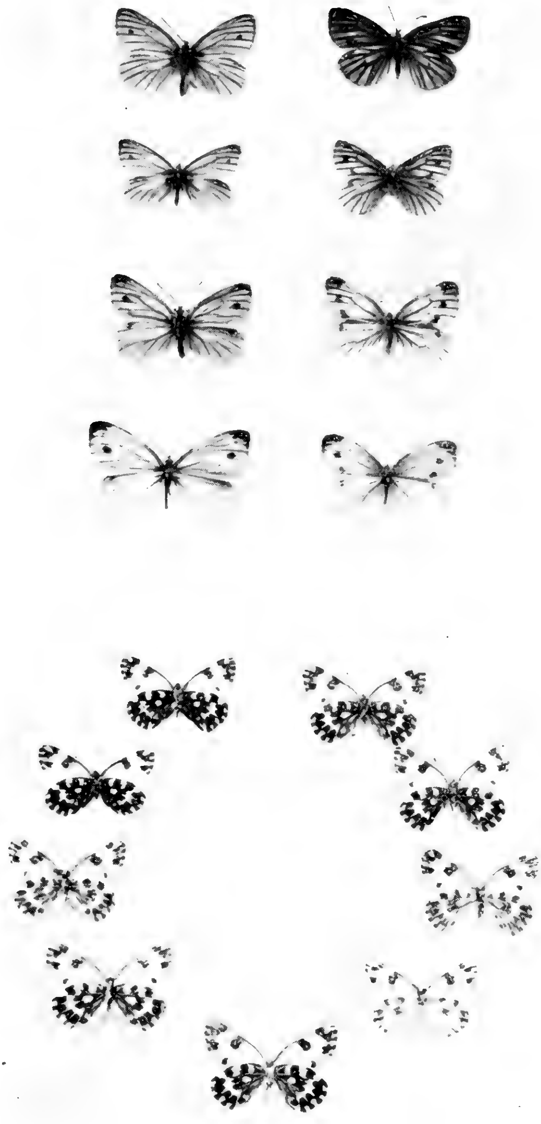
Figures show a decreasing amount of melanism from top to bottom, *i.e.*, from the hypothetical extreme winter form *bryoniae* to the extreme summer form *pseudorapae.*

Lower half.

Pontia daplidice.

A series of specimens captured in Mesopotamia by Col. H. D. Peile, F.E.S., is shown. They were taken at intervals throughout a period of 12 months, and are arranged to show the gradual transition from the small dark winter forms (January, February), through the larger (except the extreme June specimen) and paler summer forms back to the winter form in November.

The actual months of capture, reading anti-clockwise, from the top (left), are :—January, February, March, April, May, June, July, October, November.



SEASONAL FORMS OF RHOPALOCERA.

Explanation of Plate VI.

Seasonal Variation in Rhopalocera :—Satyridae and Papilionidae.

Upper half.

Satyridae.

Left hand figures: The upperside (top figure) and the underside of a wet season specimen (middle) and of a dry season specimen (bottom) of *Melanitis leda* are figured, to show differences of shape and marking in the seasonal forms.

Right hand figures: A similar set of the Indian species *Mycalesis* (*Calysisme*) *visala*.

Lower half.

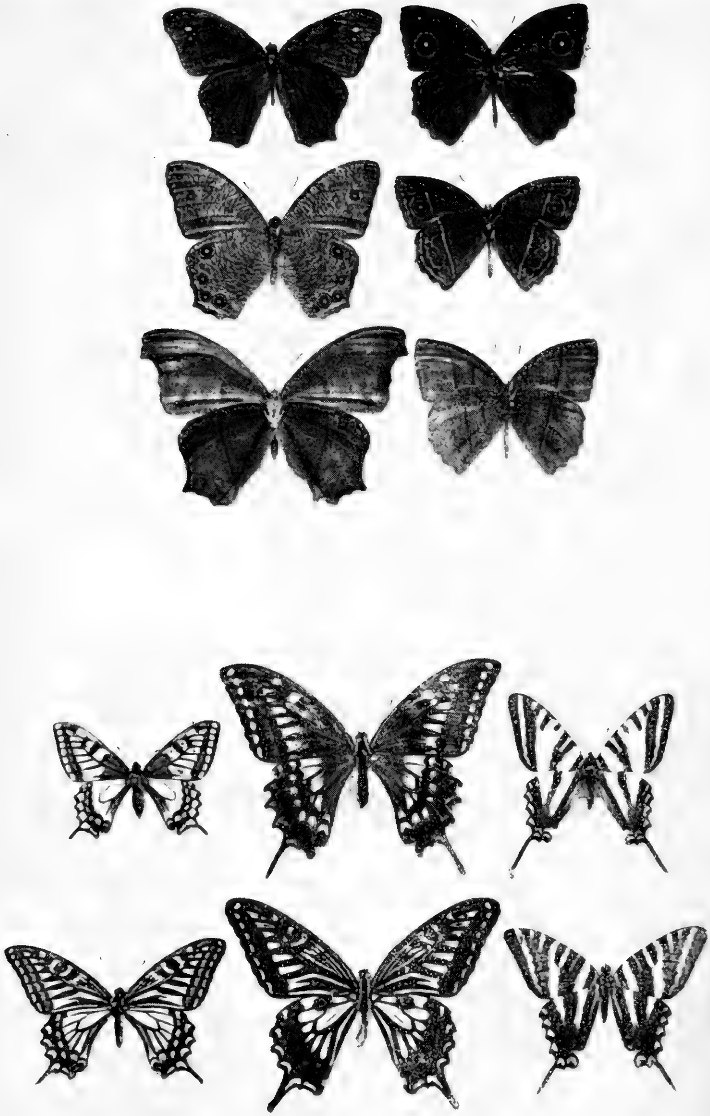
Papilionidae.

The figures represent extreme spring and summer forms of three species of "Swallow Tails."

1. *Papilio machaon*, from Japan.
   Top left hand figure shows spring form; top centre figure, summer form.

2. *Papilio xuthus*, from Japan.
   Bottom left hand figure shows spring form; bottom centre figure, summer form.

3. *Papilio marcellus*, from N. America.
   On right hand side, upper figure shows spring form; lower, summer form.



SEASONAL FORMS OF RHOPALOCERA.

Explanation of Plate VII.

Seasonal Variation in Rhopalocera :—Nymphalidae.

In all cases the figure on the left represents the wet season form of a species whose dry season form is shown on the right. All are African.

1st pair.	*Precis octavia.*
2nd ,,	*Precis pelarga.*
3rd ,,	*Precis archesia.*
4th ,,	*Charaxes zoolina*—upperside.
5th ,,	,, ,, —underside.

SEASONAL FORMS OF RHOPALOCERA.

ANNUAL ADDRESS TO THE MEMBERS

OF THE

South London Entomological and Natural History Society.

Read January 22nd, 1925.

By Capt. N. D. Riley, F.Z.S., F.E.S.

LADIES and GENTLEMEN. Once more, constrained by custom and our Bye-Laws, it is my duty to address some few words to you. Unfortunately neither custom nor the aforementioned bye-laws lay down any rules for the guidance of the occupant of this Chair, who is therefore left a free hand to inflict upon you whatsoever he will.

Let us therefore briefly review the events of the past year so far as this Society is concerned. I will not trouble you with a repetition of our Council's very full Report, but there are one or two other matters to which I think attention should be directed. Our Membership, in spite of deaths and resignations is well above 200, creating in fact, a new high record, and is in itself a clear indication of the flourishing condition of the Society. But we want many members yet if we are to put the finances of the Society on a really firm basis, and I would like to urge upon members the necessity for bringing fresh recruits to our ranks. Attendance at our meetings has been well up to the average of the years which I can remember; so too has been the standard of exhibits, whilst we have again been fortunate in the number and excellence of the papers, which have been read before us.

The alterations to the premises, to which I referred last year, have been completed, and although not intended for our especial benefit have resulted, as we expected, in a decided improvement, especially in the lighting. They have resulted too in forcing upon our notice the congested condition of our library. We are urgently in need of more book-case accommodation; but on the other hand there is considerable difficulty in finding room to place any further book-cases were we to obtain them. Attention, therefore, has mainly been directed to the disposal of books which are not really required, so as to make better use of the space we possess. There is really a very large number of books and periodicals for disposal, and amongst them I feel sure there are many, which members would be glad to have at the very moderate prices asked for them. Yet in spite of repeated advertisement of this fact at our Meetings the Librarian still reports that there is the greatest difficulty in disposing of them. The state of affairs is so serious that I feel fully justified in calling attention to it on this occasion, in the hope that members will take the first opportunity of doing both the Society and themselves a good turn by relieving the Librarian of his surplus books.

At the meeting held immediately prior to our last Annual Exhibition of Varieties, the suggestion was brought forward that that meeting should be made less formal, more of a conversazione, in nature. Unfortunately, time was then too short to allow of proper arrangements being made along those lines, and the result was that a compromise was agreed upon. Unlike most compromises this one, I think we may say without fear of contradiction, was a decided success. The assurance given to members and visitors that their exhibits would not have to be passed from hand to hand around the room went far to securing this, and the experience gained fully justifies us, I think, in carrying the idea still further another year and reducing the formalities to the absolute minimum.

Our popular Treasurer,—and it is not often one can truthfully say of a Treasurer that he is popular—again presents us with a very satisfactory report. It is especially gratifying to learn that the legacy of our late member Mr. Lachlan Gibb, has at last come to hand. Although this is not the first legacy the Society has ever received, let us hope too that it will not be the last. With regard to our finances, the only matter, which to my mind needs overhauling, is the publication fund. For many years now it has been our regular custom to ask for donations to this fund in order to meet the cost of printing our annual volume of Proceedings. I am not at all sure that this is really good policy. It results to a certain extent in members, who are regular attendants at our meetings, being penalised for the benefit of those who do not attend and who must consequently rely upon our Proceedings for news of our doings. That is to say, those who most need the Proceedings contribute, on the average, least towards them. By spreading the burden more evenly over the shoulders of all our members, we might obviate the necessity of having what amounts to a regular annual collection. I would recommend this problem to the consideration of the new Council, feeling sure that it should not prove very difficult of solution, for in my opinion it certainly needs attention.

As you have already heard in the Report of the Council, we have suffered two losses by death in the twelve months which have just elapsed.

Mr. W. West, of Brockley, was seldom seen at our meetings. A son of our late familiar Curator, he continued the family connection with the Society for as long as it was permitted him to do so, and passed away at the age of 61. He had no collections.

Mr. W. E. Butler, of Reading, was born in Reading on August 17th, 1854. He was interested in Natural History from boyhood, and, in 1880, was one of the founders of the Reading Natural History Society of which he was for some time President. Many years ago he was appointed honorary curator of the Entomological section of the Reading Museum, which position he held until his death. In 1913 upon his election to the Town Council he was made a member of the Museum Committee, and he rarely missed a meeting. He had a very fine collection of the Lepidoptera of the Reading district which his widow has had attended to professionally, but at present there is some doubt as to its ultimate destination. In Coleoptera he had also a fine local collection, including one species which for some years bred in his cellars at Reading, the only place in England where it occurred, and which has now become extinct. He was elected a member of the Society in 1890, and a fellow of the Entomological Society in 1902. Mr. Butler was in his office apparently quite well a few minutes before the end, which occurred in the presence of his partner sons, at business on Thursday, February 28th 1924.

Outside our own immediate circle our losses have again been heavy. Canon Theodore Wood had a very wide range of interest in Natural History and was an excellent lecturer. He is perhaps best known as the author of several popular works on Entomology and kindred subjects. A memorial is being erected to him in his old church, St. Mary Magdalene, Wandsworth Common.

Frank Merrifield's most important entomological work was directed to the experimental elucidation of the effects of temperature upon variation in the Lepidoptera, continuing the work of Weismann and Standfuss. He also was led to study the influence of surroundings upon the colours of the exposed pupae of certain butterflies. But we owe him a still greater debt for his perseverance and ultimate success in securing for us the first of the English translations of Fabre's writings.

In Arthur Hugh Jones, there passed away last February, when in his eighty-fourth year, to quote the words of another writer "one of the best known, most liked and most charming of contemporary British Entomologists." Though his writings are not many, he will long be remembered for his work in connection with the Entomological Society of London, of which, for many years, he was Treasurer.

Herbert Augustin Jenner, a past member of this Society, will best be remembered for his interests in the natural history of East Sussex, the district in which he lived, and of which he published a List of the Macro-lepidoptera; like most Entomologists he attained a ripe old age, being 74 at the time of his death.

Colonel Swinhoe concerned himself little with British Insects, but his writings on oriental, principally Indian, Lepidoptera are numerous and voluminous. After the death of Frederick Moore he completed that author's already monumental work, *Lepidoptera Indica*, by adding to it the greater part of the last three volumes.

Colonel Fawcett and Colonel Jermyn likewise were principally interested in Indian Rhopalocera, the former obtaining and describing many of the first examples of species occurring in the districts since traversed by the Mt. Everest Expeditions. Colonel Jermyn, almost to the day of his death, also took a very active and wide interest in the Entomology of Somerset, being an authority locally on many different orders.

Perhaps the greatest loss to Lepidopterists during the past year, however, occurred by the death of Charles Oberthür, at Rennes on June 1st, 1924. There cannot be a collector of Palaearctic Lepidoptera, who did not at least know his publications; many of them must have been personally acquainted with him. I count it among my greatest disappointments, that I never met him, for there is a charm about his writings, which is irresistible. Fortunately for us he leaves in his *Études* a fitting monument to his devotion to the Lepidoptera, for these volumes are of an excellence, more particularly in respect of the illustrations, which could hardly be surpassed. It is the greatest pity that his almost unrivalled collections cannot remain intact, but are being broken up and sold piecemeal to all and sundry.

But if the year that has just drawn to a close has not been without its losses, yet equally it has not been without its gains. Signs of a general post-war revival of interest are everywhere apparent. The increase in our own membership to the highest yet reached, is a very good general indication of this, especially when viewed in conjunction with the experiences of other societies of a similar nature.

In the sphere of more specialised work a re-awakening of interest in the entomologist's bugbear, names, is shown in the resuscitation of the British Entomological Committee on Nomenclature, with one of our members, Mr. Tams, as Secretary. This question of names, and the changing of names, is bad enough for all of us, but it is a positive nightmare to the systematist working at Lepidoptera. There will be no peace till the ghosts of all bad names are laid; may the new Committee's labours be not in vain.

Much has been heard of late of the protection of British Butterflies,—and not before it is needed—from the depredations of unscrupulous collectors. It is extremely difficult to know what to do in this case. So long as human nature remains unchanged and there is a good market for varieties, such as I sometimes hear referred to as "stris" or "obs," or for specimens suitable for ornamental purposes, and so long as it gives us pleasure to have varieties or quantities of rare species which nobody else has, just so long will it be before these over-persecuted butterflies are given a rest; which is the equivalent of admitting our inability to protect them. All we can hope to do therefore is to bring moral pressure to bear upon really serious offenders—and this I sincerely hope all of us will do, whenever and wherever the occasion arises. In this connection much is to be hoped in the future from the recently formed Central Correlating Committee for the Protection of Nature. It is really to call attention to this body that I raise the question of our disappearing fauna on this occasion.

At this point we might I think change the subject, and touch briefly on the question of

Seasonal Variation in Butterflies.

I suppose most of us, who are interested in Butterflies, are now so familiar with the phenomenon known as Seasonal Dimorphism, that we take it for granted and seldom pay much attention to it; in any case I think we can dispense with a definition. Nearly all our British species, which are double-brooded, exhibit some slight differences at least between adults of the two broods, whilst many show a strong divergence. *Pieris rapae*, *P. napi* and *P. brassicae* are probably our three commonest dimorphic species. How different are the spring and summer broods of these three species is shown by the writings of some of the earlier entomologists. J. F. Stephens for instance regarded *P. brassicae* as really two species, *P. brassicae* (the summer brood) and *P. chariclea*, although the latter of course is really only the spring brood of the former. *P. rapae* similarly appears in his writings partly as *P. rapae*, partly as *P. metra* (the spring brood), whilst *P. napi* (Plt. V.) appears under three different headings *P. napi*, *P. napaeae* and *P. sabellicae*. That the true relationships to one another of these named forms was at least suspected by some entomologists at the time of the publication of Stephens "Illustrations of British Entomology" (1827) we may infer from the fact that the author was at some pains to justify his attitude. Writing of *P. chariclea*, he says, "Now, if it be a vernal brood of *P. brassicae* alone, by what process do the colour and the shape of the markings become changed? and whence its inferior size? The first question has been answered, at least so far as regards the colour, upon the supposition that the solar rays are not sufficiently powerful at the period when the insect is produced, to produce the intense hue so conspicuous in the supposed aestival brood, or *P. brassicae*," etc. Since those days, many entomologists have asked themselves the questions put by Stephens; but we have not the answer yet. I have often wondered who was the first man to prove that Stephens *brassicae* and *chariclea*, *rapae* and *metra* were but the two broods of two species; for whoever he was, he was the discoverer of seasonal dimorphism in butterflies.

Other familiar cases in this country are those of *Lycaenopsis argiolus*, the Holly Blue and *Heodes phlaeas*, the Small Copper. On the Continent of Europe naturally one finds other and more striking examples, the best known undoubtedly being furnished by *Araschnia levana*, of which the spring brood is mottled black and brown, the summer brood black with a white band, rather like a *Limenitis**. These, until about 1830, were considered distinct species. Other species

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* It has recently been suggested that this white banded summer form has been produced in mimetic association with the genus *Limenitis* (*Ford*, "Proc. Ent. Soc. London," 1925), but the evidence in support of the theory is very slight.

which are seasonally dimorphic to a noticeable degree are *Euchloë ausonia* and *E. belemia*, *Pontia daplidice* (Plate V.) and *Leptosia sinapis*, whilst to a less noticeable extent, this form of variation is apparent in many *Lycaenidae* and *Satyridae* and some few *Nymphalidae*. It is, in fact, present in nearly all double or multi-brooded European species of butterflies, excluding the *Hesperiidae*, although not always immediately apparent, and is most fully developed in the palaearctic region in the families *Pieridae* and *Satyridae*.

When we turn our attention to other lands, we find a somewhat different state of affairs. The palaearctic region enjoys two seasons, summer and winter. These terms however are hardly applicable to the tropics. Here the seasons, such as they are, are not marked to any appreciable extent by variations of temperature, but by variations of rainfall. Hence we have wet seasons and dry seasons, usually very regular in their times of occurrence and duration, the wet seasons being generally accepted as corresponding with our summer, the dry season with our winter. Certain large areas are exceptional in that their climatic conditions are fairly constant throughout the year, notably the tropical rain forests of South America and West Africa, and the islands of the Malay Archipelago, but the rule is generally applicable to the larger land areas lying within the Tropics. In other places there are indeed complications in that there are "rains" and "little rains" each year, so that there are two wet and two dry seasons per annum, but these places are not many, or the "little rains" are of such short duration that the Rhopalocera seem hardly to have time to react to their influence.

Of the three major faunistic tropical regions of the world, the American, African and Indo-Australian, that in which we find least tendency to seasonal dimorphism amongst the Rhopalocera is the American. Here the climatic conditions are so uniform that it is only along the edges, north towards Mexico, south towards the Argentine, that we find seasonal variation of any extent, for it is only here that there commence to occur any marked changes in the seasons. It may be that we have not yet sufficient accurately dated and bred material from South America, to give us the clue to seasonal variations hitherto unsuspected. But I do not think this is the case, for it seems only reasonable to suppose that, if present, this form of variation will follow the same lines in South American butterflies as is known to be the case in other parts of the world. Certain South American Satyrid genera, notably *Euptychia* and *Taygetis* are composed almost entirely of dull brown species bearing on the undersides rows of eyespots. They are related very closely to the old-world genera *Melanitis* and *Mycalesis*. These latter, to which reference will also be made later, are extremely susceptible to seasonal variation, the 'wet' and 'dry' forms being very definite and at once recognisable. Forms exist amongst the S. American genera *Euptychia** and *Taygetis* showing both these types of underside coloration, and all the intergrades. We seem quite justified therefore in connecting them together as seasonal variations parallel with those known to exist in the Old World, although there is no proof whatever that this is the case.

Again we find there exist in the *Pieridae* of S. America variations similar and parallel to those of the *Pieridae* of the Old World. But here we are fortunate in having at least a little experimental evidence † as well to support the conclusions, which otherwise had till then been based principally on analogy. Some of the forms of *Terias*‡ have been bred in the N. Argentine, and of the genus *Pieris* elsewhere, showing that opinions based on other, known, cases of seasonal variation were correct. In the *Nymphalidae* and *Danaidae*, there is little evidence of variation of this nature, except in one or two isolated genera such as *Phyciodes*, a puzzling group of species related to *Melitaea*, and *Temenis*; and it is principally amongst those species of *Phyciodes*, which range into the temperate regions, both north and south, that the phenomenon appears to be present. In the New World *Lycaenidae* the only cases known to me are to be found amongst the *Lycaeninae* of the temperate regions, whilst in the *Erycinidae* and *Hesperiidae* so far as I am aware there are no known cases.

In southern Asia and the southern portions of the palaearctic region the phenomenon is much more frequently met with. De Niceville, writing in 1884, was the first, so far as I am aware, to call attention to the variations of the 'eye'-markings on the under-

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* See *Longstaff* "Butterfly Hunting in Many Lands," p. 578, where the seasonal variation in *Euptychia hermes* is tabulated.

† See also Longstaff *l.c.*

‡ Jorgensen found that larvae of *Teriocolias atinas* collected at an altitude of 2400 metres, taken for a while to an altitude of 3100 and subsequently to 1070 metres, where they emerged, produced the form *shiptone* hitherto regarded as a distinct species. The differences separating the forms are readily compared with those found between the winter and summer forms of *Terias* in Japan.

side of Indian Satyrid butterflies of the genera *Mycalesis*, *Ypthima*, *Melanitis*, etc. (Plate VI.), and to express the opinion, afterwards confirmed by breeding experiments, that the 'eyeless' dry season specimens were the progeny of the 'eyed' wet season butterflies. These butterflies have much the same habits as our own *Epinephele*, being found chiefly in long grass, jungle, etc., and he therefore offered the explanation, that the eyed form was probably the ancestral form, the eyeless having been evolved by natural selection, for, during the dry season, the nature of the jungle is such that it would render any butterfly with large and conspicuous eyespots far too conspicuous for safety from the attacks of insectivorous animals.

Since those days seasonal variation of this kind has been shown to exist in a large number of genera of Indo-Australian butterflies, distributed throughout all the generally accepted families. In the *Hesperiidae* however, but very few cases appear to exist, and of these only two have been confirmed by breeding experiments. These are *Coladenia indrani* and *Abaratha ransonnettii*. What appears to be seasonal variation exists also in the genera *Daimio*, *Sarangesa* and *Satarupa* and possibly in *Celaenorrhinus* too, all genera belonging to the Hesperiine group of *Hesperiidae*. But we have no evidence from breeding experiments bearing upon these species, and but little from examination of the structure of the supposed varieties themselves.

There remains only the continent of Africa to examine, and here we at once meet with seasonal variation at its maximum. If we exclude N. Africa, which belongs to the palaearctic region, the extreme of S. Africa, which is not tropical, and the Congo Basin with that part of the West African Coast, which forms part of the same tropical rain-forest region, we are left with a vast land area productive of by far the most remarkable and numerous cases of seasonal variation hitherto brought to light. It is interesting to notice however, that in the genus *Papilio*, which in other parts of the world has produced several remarkable seasonal forms (Plate VI), in Africa produces none. But it should be remembered that the African Swallow-tails we refer to are all inhabitants of tropical or subtropical regions. On the other hand those Swallow-tails, for example *Papilio marcellus*, in North America, and *Papilio xuthus* in China and Japan, which produce these seasonal forms, may be regarded perhaps as stragglers from warmer regions, or more probably as old inhabitants of regions once warmer, who have managed to continue an annually double or multi-brooded existence, but at the expense of a marked modification in the spring brood as the result of exposure to the winter cold. Weismann of course maintained, in the case of the European *Araschnia levana*, that the spring form is the ancestral form, the summer form having been modified later as a result of the warming of the climate after the glacial period. But it always seems to me that he is allowing really too short a period of time for the introduction of these modifications and that we should look much further back than that. The glacial period occurred during Pleistocene times; but there are undoubted lepidopterous remains, not widely differing from existing genera, known from the vastly older Mesozoic deposits. Part of Weismann's argument, too, was based upon his experience that it was always easier to produce experimentally the winter form but very difficult to produce the summer form. Therefore he assumed the winter form was ancestral. It was later shown by Merrifield that Weismann's experimental methods alone were at fault, for he found it possible to produce any number of successive generations (of *Araschnia levana*) all of the summer form.

It seems quite justifiable to suppose the earliest butterflies arose in warm regions; in fact it is impossible to conceive of their origin in cold regions. Hence the butterfly population of the temperate and cold regions, we may safely assume, owes its origin to colonists from warmer regions, and the ability to withstand a really cold winter must have been gradually acquired afterwards. That a subsequent modification in the summer form may have arisen is of course always possible.

Such extreme summer forms as the *pseudorapae* form of *Pieris napi* and the extreme 'dry' forms of the African *Teracolus* we know must be recent developments, for the climatic conditions under which they exist, are themselves only of comparatively recent development.

But let us revert to the African cases of seasonal dimorphism. In the *Papilionidae* there are no definite cases. In the *Pieridae*, on the other hand, there is hardly a species which does not appear to show it, if we exclude those species which are only found in the rain forests of the Congo basin, etc., and many species, notably in the genera *Teracolus* and *Terias*, exhibit it to an astonishing degree. The most general feature of this seasonal dimorphism, or perhaps one should say polymorphism, in *Teracolus*, is the large size and melanism of the wet season forms, the reduction of black markings on the upperside, and the production of finely striate brownish, buff or even pink, 'sandy' undersides—which in wet forms are white—and the small size of the dry forms. This question of size is interesting, for it is the reverse of what is found in other families, the dry season specimens being almost invariably larger than the wet season forms. It is due to the rapidity with which, in the *Pieridae*, the broods succeed one another. A brood may pass through the whole of its metamorphoses within a month, *i.e.*, well within the period of a dry or wet season, and not overlap from one season to the other as appears to be normally the cases in other families. Thus larvae feeding up on withering or scanty vegetation and pupating during the dry season would produce extreme dry season forms during that season, and would not carry on to produce the small wet season forms as in other families.

In the African *Danaidae* the phenomenon seems to be entirely absent. In the *Acraeidae* it is present to a limited extent, notably in the *acrita* and *caldarena* groups. But it appears only to have been developed in areas such as Northern Rhodesia which are subject to extreme differences as between wet and dry seasons. The African *Satyridae* are only represented by fifteen genera. Of these, four (3 South African and the genus *Pararge*) show no seasonal variation; five others (1 Congo; 3 South African; 1 Madagascar) do not seem to show it, but it may be present. The remaining six genera, however, which contain a majority of the African species, are strongly seasonally dimorphic. These are *Melanitis*, *Gnophodes*, *Mycalesis*, *Henotesia*, *Ypthima* and *Physcaenura*. In all these the wet forms are characterised by strongly developed ocelli, on the undersides, especially of the hindwings, these ocelli being reduced to pinpoints, or entirely absent, in the dry forms. The dry season forms have leaf-like undersides as well and are almost invariably larger insects than the wet season forms. In fact the differences are just the same as are found in American and Oriental members of the family.

One of the most remarkable cases, if not the most remarkable, in the *Satyridae* is that of *Henotesia perspicua*, Trimen. Several observers had suspected that between the so-called species *birsha*, *victorina*, *teratia*, *simonsii* and *perspicua* some closer relationship existed than was indicated by their usual systematic arrangement. Dr. G. A. K. Marshall in 1896, Dr. S. A. Neave in 1910, and subsequently the late H. C. Dollman, all came to the conclusion that the *simonsii* form was the dry season form of *perspicua*, and I myself pointed out in 1921 (Trans. Ent. Soc. Lon.) that the series then in the British Museum permitted the formation of a complete series of gradations from the dark brown ocellate " wet form " *birsha* through *perspicua* (=*victorina*) and *teratia* to the pale ochreous dry form *simonsii*, the dates of the first showing that it occurs only in the rainy season, of the last only in the driest season, and the others for the most part in intermediate periods. This evidence seemed quite sufficient in itself, but in the absence of proof which could only be obtained by breeding experiments, I recently examined the genitalia of these forms for further evidence of their specific identity. The results were somewhat surprising, and go to show how necessary it is to take into consideration as many characters as possible, before 'jumping to conclusions.' The external features of these insects, *birsha*, *perspicua*, *teratia* and *simonsii*, as already stated, are such that they appear to form an excellent gradation from one extreme to the other. One of each was therefore dissected to commence with. Imagine my surprise when it appeared, that although there was not the slightest difference between the genitalia of *birsha* and *simonsii*, the two extreme and most dissimiliar forms, those of *perspicua* and *teratia* were quite different from them and from one another. At first I thought this might be but individual variation, which in some species in considerable. Seasonal variation in the genitalia, an extremely rare phenomenon, it could not be, with the apparently intermediate forms differing from the two extremes, which were alike. However, after dissecting and examining some further twenty specimens the solution was found. The *perspicua* of most collections consists of two species, and *teratia* is apparently a good third. *Perspicua* ranges from Abyssinia to Natal. Its underside has always the appearance of an intermediate form, that is to say the eye-spots are never very large, and the ground colour is always slightly 'grained.' On the upperside the colour is always dark brown, even in those specimens in which the underside is as 'dry' as is that of *simonsii*. The other species is *birsha*, with dry season form *simonsii*. I have not yet found any intermediate specimens. My earlier opinion, that these forms, because they appeared to lead insensibly from one extreme to the other, really represented only one species is therefore seen to be a very long way from the truth. The so-called connecting links between the two extremes, really represent two species themselves, whilst the extremes themselves represent only one.

Of the other Satyrid genera which have already been mentioned, *Mycalesis* affords a number of interesting examples, such as *M. safitza*, *M. cooksoni* and some of the species more closely related to these, their variations being almost such as to suggest a faint parallelism with that of *Henotesia birsha* just dealt with. *Ypthima* shows only a normal amount of seasonal variability on perfectly regular lines; in the other two genera however, *Melanitis* and *Gnophodes*, variation seems to go by no fixed plan. Although perhaps most of the individuals to be taken in the wet season are of the 'wet' form, and most of those taken in the dry season are of the 'dry' form, yet a large percentage always seems to be on the wing at the wrong season. That is to say all the different forms quite frequently occur together. I think we can only explain this on the assumption, that the response of the individuals to the physical conditions governing the production of the different forms is so delicate and developed to such a pitch, that minute local variations in temperature, humidity, or whatever is the final deciding factor, will meet with an immediate response from the individual in the area affected. However, it is not my intention to-night to discuss the factors governing seasonal variation, so we will pass on to the next family.

The African *Nymphalidae* offer the most remarkable of all known cases of seasonal dimorphism. The extent to which it has been developed in the different genera varies considerably, but it has been recognised in at least half the genera although there is little actual proof of it in some. The best known cases occur in *Charaxes*, *Hamanumida*, *Byblia*, *Kallima*, *Catacroptera* and *Precis*. In *Charaxes* only some four species out of a total of nearly 70 are concerned; but these are sufficiently striking to make up for the rest. They are *Charaxes zoolina* (Plate VII.), *C. ehmkei*, *C. kahldeni* and *C. betanimena*. In all of them the wet season form is a pale greenish butterfly with heavy black markings above and below; the dry season form, on the other hand, is pale brown with darker brown markings on both surfaces—a truly astonishing amount of difference. It has been suggested that certain other species of *Charaxes* also exhibit seasonal variation, and this is more than probable, but it is not in the same class with *Charaxes zoolina* and its allies, and there is little possibility of the forms being regarded as distinct species, which was the case with all those of the *zoolina* group.

Hamanumida daedalus and the species of *Byblia* are not so striking. In the dry forms there is little to be noted, except the toning down of the black and dark markings to the more uniform browns characteristic of these forms. In *Catacroptera*, a close ally of *Precis*, a similar condition obtains, coupled with a prolongation of the apices of the forewing, a very common feature in dry forms, particularly to be noted in *Precis* itself.

Precis (Plate VII.) contains the most remarkably dimorphic of all seasonally variable butterflies. Some twenty-four species occur in Africa and, prior to the experiments of Dr. Marshall and others, the number was thought to be at least three times as great. I will not weary you with an enumeration of the species and descriptions of their forms; it would take too long. It will serve my purpose to remind you of the most extreme case of all, that of *Precis octavia*. This occurs in the wet season as a bright red butterfly with strong black markings. Dr. Marshall's proof, by breeding experiments, that the blue and black butterfly, known till then as *Precis sesamus*, was but its dry season form, did more to open the eyes of entomologists to the possible extent of seasonal variation, than any other piece of work of a similar nature carried out before or since. Variation of this type in the other species is certainly less spectacular, but none the less extraordinary and interesting. The wet form of *P. archesia* is dark brown with a wide yellowish band across both wings; its dry form loses the yellow band entirely and its forewings become marked with numerous short bands and lines of delicate grey-blue. *P. pelarga* is very similar to *P. archesia* in its wet form; but its dry form has the dark brown areas less dark and the band redder and suffused, together with other parts of both the wings, with greyish blue again, the underside becoming absolutely like a dead leaf, and the apices of both wings much produced, to enhance the leaf-like effect of the underside. This last feature is general throughout the genus in the dry forms and is accompanied by larger size, and, as Prof. Poulton has demonstrated, greater weight. The explanation of this, of course, is the fact that the dry season butterflies result from larvae, which feed upon the luxuriant vegetation of the wet season, the species being double brooded, or at any rate having but one brood to feed up during the dry season, although possibly several may do so during the wet season, not breeding continuously throughout the year as is the case with the *Pieridae*. So much importance is attached to the nature of the food by some entomologists that it has even been suggested by Mr. T. R. Bell of India that wet season forms ought to be called "dry food forms" and vice versa. But we should thereby be attributing to one factor a degree of importance, which, as far as we know at present, is out of all proportion to its real influence. In any case if the condition of the food is a determining factor it ought to be a simple matter to test the theory experimentally.*

To complete our survey of the African butterflies there remains but three families, the *Erycinidae*, the *Lycaenidae* and the *Hesperiidae.* The first we can dismiss at once. It contains only two or three species, none of which appear to exhibit the phenomenon with which we are concerned. The case is different with the *Lycaenidae.* Seasonal dimorphism appears to exist here to a considerable degree, but unfortunately the family has been but little studied from this point of view. There certainly are no such cases as those we have just noticed in the *Nymphalidae*, the variations being more on a level with what we know to exist in our British Blues and Coppers. *Everes micyclus* and *E. togara* were for some time thought to be seasonal forms of one another, their appearance suggesting it, but as Mr. Bethune-Baker some while ago shewed them to be distinct species, that case has been disposed of. The genera *Thermoniphas* and *Oboronia*, containing species which are

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* Since writing the above I have received another letter on this subject from Mr. Bell, which is so interesting that I offer no excuse for quoting it here. I asked him about the possibility of testing his theory experimentally. He replies that, unfortunately, he has not the facilities, and goes on to say: "About that "dry-leaf season" and "tender-leaf season" it would, I think, be a difficult matter to prove completely. One would have to have a large green-house or something to prevent evaporation and keep the moisture in in the dry weather—to make the thing like a cool jungle. Leaves also, when on the trees, keep fresh and have life in them; when picked it is nearly impossible to prevent them from drying up too quickly. One would have to plant the trees in the conservatory.

"It is an absolute fact that all insects that are accustomed to young leaves when caterpillars have seasonal forms well distinguished from each other; those that eat mature leaves have none. I suppose *Melanitis ismene* is perhaps the most, or one of the most, strongly characterised in this way. The larvae feed upon grass, rice, etc. Immediately the grass begins to get old or hard, we get the dry-season deadleaf type of underside with great hooks to fore-wing; immediately the young rice is put down and the grass comes up in the hot weather, we get the so-called "rains form" or "wet-season" type, which continues for another brood. Indeed all the blackest forms of the ordinary white Pierids are hot-weather, tender-shoot insects, that is, derived from larvae that have fed upon such; this blackness becomes less as the rains advance and, towards the end of the monsoons, pure white forms (or nearly so) of *Huphina remba*, *Appias hippo* and so on that are sometimes nearly all suffused with black at the beginning of the rains, begin to make their appearance. I have been breeding *Kallima horsfieldi* lately. I caught the female at toddy in June, just when all the young shoots of *Strobilanthes callosus* were making their appearance. The larvae, therefore, fed upon them and all turned out, eventually "rains forms" of the butterfly. I succeeded in pairing these children again and got another brood that grew as larvae very irregularly, and came out even more irregularly as imagines. The grandchildren were at first "rains type" (what is white with black borders of variable width, certainly look as if variation may be to some extent seasonal, but they have not been critically examined. The species of *Zizera*, as elsewhere, exhibit a certain amount of variation which may be seasonal, but I have not been able to find any evidence on this point. Passing to the Coppers and Hairstreaks we find seasonal dimorphism in *Axiocerses*, a genus of tailed species of a copper colour, with black markings above, and dark, silver-spotted undersides. It takes the form of a general lightening of the dark markings and brightening of the copper colour coupled with the disappearance of the silver spots and a much paler underside in the dry forms. And this type of variation runs through a number of more or less closely related genera such as *Aloeides*, *Crudaria*, *Spindasis*, *Zeritis*, and *Aphnaeus*. But the sub-family in which seasonal dimorphism would appear to be most strongly developed is the *Lipteninae*. This very interesting sub-family is peculiar to Africa, and many of its species are remarkably variable. It has received, and is now receiving, a good deal of attention from very capable hands, but, so far as I am aware nobody has

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called that and which, by force of circumstances, is, in this case of *Strobilanthes*, true) having still fed mostly on more or less tender leaves; afterwards they became more and more dry-season form, because their larvae had been forced to subsist on the harder, mature leaves; the very last that were born in November were very fine imagines much lighter on the undersides, with enormous peaks to forewings and long lobes to anal end of hindwings.

"I have bred, let us say at a small computation, ten or twenty thousand butterflies and moths in the last thirty years and have always found that the "tender-shoot" imagines were the darkest, most definitely marked on the underside in the cases of *Lycaenidae*, and rather smaller in size; the mature, hard, drier-leafed plants producing slower-growing caterpillars, in the end mostly larger when the supply of food was always sufficient, and lighter imago-forms; with the more intricate, mixed pattern of underside in the Blues. What I think is proof positive of what I say is that there is quite a number of plants here that start producing tender shoots when the weather is driest and hottest in March—when there is never any rain. Invariably the butterflies that come from the larvae feeding upon those shoot-leaves are of what is generally called the "wet-season" brood. Personally I have no doubt at all that the juiciness of the food is what produces the so called "wet-season" coloration and not the dampness of the atmosphere. If one only had a large green-house one could get absolute proof of course by keeping the plants in the growing state and the caterpillars away from the damp atmosphere (anyway out of the rain) and nipping off all the young shoots that form on the plants, so as to prevent the caterpillars getting any. I am nearly certain that one would get imagines of the dry-season forms that way in the middle of the rains. Of course other factors must come in to a certain extent such as the hereditary tendency to turn into one form or the other because of thousands of years of unvaried exposure to identical periodical conditions. But I do not imagine that even the hereditary tendency would be strong enough to prevent the actual food-factor from acting, any way to a considerable extent."

as yet examined it from the standpoint of seasonal variation. The group undoubtedly exhibits however a good deal of variation in the direction of mimetic associations. It is curious to note that no species is known to exhibit both mimetic and seasonal variations—for fairly obvious reasons—and it is therefore a little difficult to estimate for this subfamily the amount of variation which is to be ascribed to seasonal influences.

There remain now only the African *Hesperiidae* to review. We have seen that as far as the Palaeartic region is concerned there are no cases of seasonal dimorphism in the family; or if there are they are of such a nature that they are only apparent upon the very minutest examination. In North and South America there appeared to be no known cases, and in the Oriental region but two species had been proved to be seasonally dimorphic, although three others, belonging to the genus *Sarangesa*, appear to exhibit this phenomenon to a varying degree, if we may trust the evidence of the male genitalia. These are *Sarangesa sati*, *S. purendra*, and *S. dasahara*. It should be interesting therefore to see whether the African climate, which, as we have seen, has had a most remarkable effect upon the families we have just dealt with, has been able to induce any comparable variation in a family so little susceptible as the *Hesperiidae*.

For our purpose we will accept the old division of the family into the *Hesperiinae* and *Pamphilinae*. In the latter there appear to be no cases of seasonal variation at all. In the former, the *Hesperiinae*, I think we shall see there are a good many. The only comprehensive survey of the group was published by Dr. Holland in 1896. In this he enumerated 97 species, or, excluding the N. African species 92, but made no mention of variation of the kind we are dealing with. However the year before, Barker, in "Trans. Ent. Soc. London," clearly indicated that he considered seasonal changes occurred in the *Hesperiidae*, but lacked material to support the opinion. Little reference appears to have been made to the subject after that, till Dr. Neave published his paper on "Butterflies of Northern Rhodesia," in the P.Z.S., 1910. In this, four species are mentioned as apparently exhibiting seasonal dimorphism. This number was subsequently increased by the late Hereward Dollman, when he was stationed in N.W. Rhodesia, but we have only the evidence of his collection and MS. notes to rely upon.

In none of these cases, however, is there any evidence, either from breeding experiments, or of a morphological nature, to support the opinions based upon examination of external characters. This being the case, it seemed that it might prove of considerable interest to examine the genitalia of all the members of this group, excepting only the species belonging to the genus *Hesperia*, which have recently been very ably monographed in the "Trans. Ent. Soc.," by Dr. Higgins. This has been done. And as a result it appears that, in spite of the many species, which have been discovered since Dr. Holland's paper was published, the total number on the evidence of the ♂ genitalia if we exclude the genus *Hesperia*, is still only 78*, as against Holland's 73, taken on the same basis. And how many of them exhibit seasonal dimorphism, or variation which has every appearance of being seasonal, can best be shown in tabular form.

Genus	No. of Species	No. of Species apparently seasonally dimorphic.
Tagiades ...	... 4	... 1
Celaenorrhinus	... 16	... 0
Eretis ...	... 6	... 1
Ortholexis ...	... 1	... 0
Caprona ...	... 2	... 1
Eagris ...	... 8	... 2
Sarangesa ...	... 22	... 10
Leucochitonea	... 3	... 0
Procampta	... 1	... 0
Abantis ...	... 11	... 2
Gomalia ...	... 1	... 0
	75	17

When it is considered how very few Skippers belonging to the *Hesperiinae* of other parts of the world show any tendency to vary seasonally, it is remarkable that approximately 23% of the African species should have developed the feature to such a marked extent. The genus *Sarangesa* easily heads the list, with nearly half its species showing strongly marked seasonal variations; and it is interesting to note that all these species are inhabitants of the open country surrounding the rain forests, in which the remaining species of the genus occur.

* The systematic results upon which this figure is based, will, it is hoped be published shortly.

Evidence based on genitalia is of course inconclusive unless the material is dated. In this respect I have been fortunate in having the large amount of dated material collected by Dr. Neave to work upon, and in many instances this has proved most valuable. The conclusions arrived at however, are, I venture to think, not very far from the truth ; and they have been based upon the examination of the genitalia of a very large number of specimens.

At various time statements have appeared suggesting that the genitalia as well as the wing-markings, may vary seasonally. Dr. Jordan in fact mentions one case in particular, which he discovered in the genus *Papilio*. Fruhstorfer also suggested that cases are to be found in the Lycaenid genus *Nacaduba*, but this allegation has since been denied by later workers. I was careful therefore, to look for any evidence on this point in the particular groups of Skippers just dealt with. I found none whatever.

In concluding this address, I should indeed be remiss, if I did not take the opportunity, of offering my most sincere thanks, especially to Mr. Stanley Edwards, Mr. Turner and Mr. Tonge for the valuable and cheerful assistance they have given me at all times, whilst I have been the occupant of this Chair; and to the other officers of the Society and members of the Council, and to all members for the patience and forbearance they have shown me, not only to-night, but throughout my tenure of office ; and also I thank you sincerely for the very considerable honour you have bestowed upon me in electing me, your youngest President, to that office. In my successor, Mr. Grosvenor, you have chosen a President who will, I am confident, fully maintain and add to the prestige of the Society, and it gives me the greatest pleasure to join you in extending to him a very hearty welcome.

ABSTRACT OF PROCEEDINGS.

FEBRUARY 14th, 1924.

Mr. N. D. Riley, F.Z.S., F.E.S., President, in the Chair.

Mr. Philip Harwood, of St. Albans, was elected a member.

Mr. Blair exhibited living specimens of a luminous Elaterid beetle, *Pyrophorus punctatissimus*, from the Argentine. After alluding to the two sets of light organs in these insects, *viz.*, a ventral concealed organ that is visible only when the insect is in flight, in addition to the two eye-like spots on the pronotum, he stated that though certain evidence points to a difference in habits of the two sexes, and to the use at any rate of the ventral organ in securing mating, he was not aware of any actual observations on these points having been published.

Mr. Hugh Main exhibited a living Mygale sp., sent to him from Trinidad by Dr. Withycombe. It was able to climb glass; and he called attention to the very delicate and iridescent hairs on the undersides of the limbs.

Mr. Rayward exhibited a "nest" of the larvae of *Nygmia phaeorrhoea* (*chrysorrhoea*), obtained from the downs facing the sea near Eastbourne. After many years of absence it was observed at Eastbourne in 1898, and also reappeared at Chatham the same year. In 1900 it was very common at Beachy Head, where it continued its existence for many years, although it had been scarce there during the last few years. This season, however, it seemed to be well re-established, for he had found quite 50 nests in the space of 15 yards. Even in winter time, in the sun, the larvae were quite active.

Mr. R. Adkin remarked that this year the "nests" in the Eastbourne area were quite as abundant as they ever had been, whereas last year he only found one nest. Mr. Buckstone said that the larvae of *N. phaeorrhoea* were a perfect pest around Herne Bay. Mr. Newman had found quite 90% of the larvae were parasitised.

Near Eastbourne Mr. Rayward had looked for the ova of the "blues," and exhibited five ova of *Polyommatus* (*Agriades*) *coridon* which he had found. Only one ovum was on the food-plant, the others being found on dried stems near by. In fact *P. coridon* seemed to lay anywhere but on the food-plant; just the reverse was the case with *P. thetis*, whose ova were invariably on the food-plant.

Mr. Blenkarn exhibited a series of *Dytiscus circumcinctus*, taken at Wicken in May, 1921.

Mr. Bunnett exhibited three specimens of a Tineid, *Scardia boleti*, he had bred from a *Boletus* fungus.

Dr. Cockayne exhibited the specimen of *Pyrameis dejeani* he had described in the Entomological Society's Proceedings for February, 1924, as having "all the scales, which should be cream-coloured, devoid of pigment, very thin, and rolled up at the tip." The condition affects the surfaces and gives a transparent appearance to the band and apical spots.

Mr. Grosvenor exhibited two cases showing the various named forms of *Zygaena transalpina*, from Italy and France.

Mr. Enefer showed a living golden tortoise beetle, *Cassida* sp.? found at Birmingham among bananas from Costa Rica.

Lantern slides were exhibited by Messrs. Main, Bunnett, and Dennis.

FEBRUARY 28th, 1924.

The President in the Chair.

Mr. Wm. Fassnidge, M.A., of Southampton, was elected a member.

Mr. S. N. A. Jacobs exhibited a varietal form of *Agrotis exclamationis*, taken by Mr. F. F. Wood, of Ditchling, Sussex, at sugar. A similar specimen was taken by him two days later. A deep black cloud lay along the disc of the forewings uniting the stigmata at their lower portions and extending somewhat beyond at both ends.

Mr. Blenkarn exhibited the beetle *Opilo mollis*, which was noted as somewhat rare. He had found it feeding on the larvae of *Anobium* species in old and rotten ash trees, at Hurtlebury, near Kidderminster. It had also been recorded from Westminster Hall, where it had been found feeding on the larvae of the beetle, which was destroying the timbers of the roof.

Mr. W. J. Lucas read a paper entitled "The Caudal Lamellae of the Naiads of the British Agrionid Dragonflies," and illustrated it with lantern slides. (See page 1.)

MARCH 13th, 1924.

The PRESIDENT in the Chair.

Mr. Arthur Valentine, of Herne Bay, was elected a member.

Mr. A. A. W. Buckstone exhibited a series of *Boarmia gemmaria*, bred from a batch of ova from Greenhithe (Kent). The series varied from very pale grey through various shades of grey and yellow to almost unicolorous dark blackish brown. Also bred varied series from Mickleham, Surrey, and Chiswick, for comparison, together with a pale dwarf example, captured in Surrey in the autumn, and presumably of a second brood, and a dark grey specimen from Burnley, Lancashire. Mr. R. Adkin remarked that the black and brown forms in mongrel broods were usually in the proportion of half and half with no intermediates.

Mr. H. W. Andrews exhibited the dead and dried larva of a New Zealand Lepidopteron, *Charagris virescens*, which had been attacked and killed by the fungus *Cordiceps robertsii*, in which condition it is known as the "Vegetable Caterpillar."

Mr. R. Adkin read a short paper entitled "Some phases of Parallel Variation in the British Lepidoptera," and exhibited a number of lantern slides in illustration. (See p. 8.)

MARCH 27th, 1924.

The PRESIDENT in the Chair.

Capt. Crocker exhibited a long series of undersides of *Melitaea athalia* shewing considerable variation in the light and dark markings, one or two specimens shewed a complete row of spots across the disc of the forewings ; the depth of colour also varied.

Mr. Wm. Hales, A.L.S., read a paper on the "Old Chelsea Physic Garden," and shewed a large number of slides in illustration.

APRIL 10th, 1924.

The PRESIDENT in the Chair.

Mr. J. L. Henderson, of Thornton Heath, was elected a member.

Mr. H. W. Andrews exhibited some examples of British Anthomyiid flies, whose larvae are injurious to crops and vegetation generally, including *Hylemyia antiqua*, Mg., whose larvae mine into onion bulbs, *H. brassicae*, Bohe., whose larvae mine the roots of cabbage, cauliflower, turnip, etc., and *H. cardui*, Mg., which attack thistles.

Mr. L. W. Newman exhibited a living full-fed larva and a pupa of *Dryas paphia*. The larvae had hibernated, and about six weeks previously he had subjected them to a temperature of not more than 75° or 80° F., or somewhat below. He also showed pupae of *Melitaea aurinia* from larvae obtained from Dorset about March 25th, when some were found to be quite full fed, while others were only just out of hibernation. He was now forcing them on to pupate.

Mr. Garrett exhibited a living pupa of the N. American *Papilio philenor*. It was noted how much it resembled a piece of broken, rough stick.

Mr. A. A. W. Buckstone exhibited a flower of the garden Anemone with a coloured petaloid bract below it.

Captain Crocker exhibited a long series of *Epinephele jurtina* from one field, showing much variation for so small an area ; and *Polyommatus* (*Agriades*) *thetis* (*adonis*) from Folkestone, and pointed to the ground colour of the underside as showing paler in the first brood, when the temperature was low, and darker (redder) in the second brood, when the temperature was considerably higher. The darker specimens, however, were not so red as were those taken in 1922, when the season was much hotter generally.

Mr. Sperring exhibited a short series of *Pararge aegeria* from North Cornwall ; also several series of *Pieris napi*, some captured in Scotland and others bred from ova laid by females also captured in Scotland, on which he contributed the following notes.

"At our meeting on the 13th March, the discussion following Mr. Adkin's paper on parallel variation travelled over rather a wide range, and in connection with climatic and artificial conditions of breeding I mentioned that wild Scottish examples of *P. napi* were much darker than those bred from the wild pairing and fed up in the South.

"I obtained from Mr. G. E. Hartley, of Aberdeen, a series of his wild-caught specimens, which I exhibit here in conjunction with a series which I bred out last year from wild-caught females, which he sent me the year previous.

"I would point out that, in regard to these Southern bred specimens, they were not treated to any artificial conditions, except almost immediately before their emergence; they were fed out of doors and kept there until April, when they were brought into a cold room. At the end of April the pupae coloured in the usual manner, and immediately the first ones started to emerge they were brought into a warm room, so as to bring the batch out as quickly as possible.

"You will note that the wild-caught specimens are much more diffused and heavily marked than the bred ones, of which I have selected the darkest only.

"I am exhibiting also a series of bred *Pararge aegeria* from North Cornwall. The pupae of these were brought indoors at the beginning of last December. In the ordinary way this insect is very susceptible to warmth; and usually I have found that they will start to emerge in from two to three weeks after being brought into the temperature of an ordinary living room. As a matter of fact the change in the colour of the pupae has shown usually in a matter of a few days. These exhibited, however, shewed no change whatsoever until the beginning of February, and they straggled out gradually all through that month. By the time that 50% of them had emerged the last of the pupae had not even started to change colour. The average temperature in which they were kept during the greater part of the day was 65° to 70° F., sometimes higher.

"Alongside them I exhibit twelve other specimens, which were kept in the cool during the whole of the winter and brought into a warm room in the early part of March. The whole of these latter emerged in fourteen days. The difference between them is readily apparent, and will show what effect a long period of heat treatment had. One does not find anything like them amongst those which followed the usual course of remaining as pupae in the cold during the whole of the winter; neither does one find anything like them under natural conditions, *i.e.*, captured specimens."

In the discussion which ensued, Mr. Adkin remarked that in an experiment so delicate as an attempt to show any difference there might be in broods of a species reared under the conditions of Scottish climate and those of the south of England, it was very desirable that all possible chances of error should be eliminated. In a species so prone to slight individual variation as *P. napi*, heredity might be a stronger factor in any particular brood than climatic conditions: and there might have been some individuality in the parents of the bred series exhibited of which we were not aware.

Mr. Sperring said in reply that, so far as he was aware, the parent females differed in no way from those of the captured series exhibited.

Mr. E. J. Bedford exhibited a large number of lantern slides on various zoological and botanical subjects, and commented on them as they appeared on the screen.

APRIL 24th, 1924.

The PRESIDENT in the Chair.

Mr. Parker exhibited an example of fasciation in *Bellis perennis*, the common daisy, from Rottingdean.

Dr. Cockayne exhibited the larvae of *Cerastis ligula* (*spadicea*), feeding on dock, from Bookham. The ova were laid from December 12th, 1923, to January 10th, 1924, and the larvae started hatching on January 29th.

Mr. A. W. Dennis exhibited examples of the flowers of Primrose and true Oxslip (*Primula elatior*), arranged on a card; and pointed out the differentiating characters. They came from St. Geldham, in Essex.

Dr. Baylis read a paper entitled "The Romance of Helminthology," describiug the life-histories of the Trematodes or "Flukes," the Cestodes or "Tapeworms," and the Nematodes or "Roundworms," of which the two latter groups are intestinal parasites in man and animals. His remarks were illustrated with lantern slides. (See page 16.)

MAY 8th, 1924.

The PRESIDENT in the Chair.

Miss L. Brooks, of 48, Anerley Park, S.E., and Mr. J. W. Cox, of 4, Elm Court, Middle Temple, E.C. 4, were elected members.

Mr. A. W. Dennis exhibited the mistletoe in flower, and called attention to the differences between the male and the female flowers.

Mr. K. G. Blair exhibited a living green cockroach, *Panchlora nivea*, L., received from Mr. Tatchell, of Swanage, who obtained it from among imported bananas.

Mr. Parker exhibited a living specimen of the large American Saturniid moth, *Samia cecropia.*

Mr. Stanley Edwards exhibited the skin of an Indian Python, *P. molurus*, from Behar, which measured 15 ft. in length.

Mr. Hy. J. Turner exhibited sixteen species of the Pierid genus *Delias*, from New Guinea, Ceram, etc., illustrative of "white butterflies," all of which had a black apical area and no other marking on the uppersides, but which were of very striking pattern and vivid colours on the undersides. They belonged to a section of the genus with species of less size than the average species, and each species was very local. In Seitz's "Macro Lepidoptera" 86 species are given with 146 named forms; only three of the species exhibited were given there; hence there were at least a hundred actual species in the genus at present. Some Indian species are found at 8,000 ft. up, while others occur at sea-level; generally they fly high and near the borders of wooded areas. They settle on flowers. The larvae, so far as known, feed on parasitic plants (*Loranthus*) allied to mistletoe.

Mr. O. R. Goodman exhibited a male Lycaenid butterfly, taken on July 21st, 1922, in the Val d'Ossoue, Gavarnie, Hautes Pyrenees, France, which he had been unable to identify with any certainty. The specimen was submitted to Mr. Tonge for him to compare with the two supposed hybrid *coridon* × *thetis* males (*polonus*), which he had exhibited a little time ago. Mr. Tonge came to the conclusion tnat it could not be an *Agriades* hybrid. Mr. Goodman had searched his notebooks and ascertained without doubt that *P. thetis* was entirely absent from Gavarnie during his visit. *Coridon*, however, was in great abundance and was of the very constant form found in the Pyrenees. It flew in company with a rather small form of *P. hylas*, which it greatly resembles in the tone of the underside, and also in company with *P. escheri*, from which it differs in many characteristics. An examination of the specimen exhibited reveals that the blue scaling of the upperside partakes both of the silvery blue of *coridon* and the brilliant sky-blue of *hylas*, being almost intermediate in shade. The underside also resembles both species in different characteristics, namely :—

Coridon.—(1) In the presence of dark crescentic markings on the marginal band of the forewings. (2) In the position, arrangement and shape of the discoidal and other spots in the central area of the forewings. (3) In the heavier dusting of blue scales at the base of the wings.

Hylas.—(1) In the browner tone of colour of all the wings. (2) In the larger size of the spots in the central area of the forewings. (3) In the presence of an extra spot near the costa (absent in *coridon*). (4) In the absence of a basal spot (present in *coridon*).

These resemblances seem to indicate that it is possibly a hybrid *coridon* × *hylas*, which does not appear to have been yet recorded. [See "Ent. Record," February, 1925.]

MAY 22nd, 1924.

The PRESIDENT in the Chair.

Mr. Blenkarn exhibited the following species of Coleoptera taken at Wicken Fen from April 16th to April 19th, 1924. CARABIDAE.—*Leistus rufescens, Bembidion fumigatum, B. aeneum, B. dentellum, B. gilvipes, Agonum livens, Pterostichus anthracinus, Trichocellus placidus, Oodes helopioides, Panagaeus crux-major, Odacantha melanura.* DYTISCIDAE.—*Hydaticus transversalis.* STAPHYLINIDAE.—*Hygronoma dimidiata, Lathrobium filiforme, Trogophloeus corticinus, Olophrum nicholsoni.* CHRYSOMELIDAE.—*Donacia dentipes.* RHYNCOPHORA.—*Dorytomus salicinus.*

Mr. Pennington exhibited a remarkable form of *Venilia macularia* having, towards the outer marginal area, a continuous but somewhat irregular band of black on all four wings, the rest of the markings being almost absent, except for a few scattered dots; an unusually pale fawn coloured *Xanthia fulvago* (*cerago*), the depth of colour in the markings also being suppressed; and a curious aberration of *Apamea secalis* (*oculea*) in which a light coloured streak arose from the reniform stigma and extended along the disc towards the base.

The rest of the evening was devoted to an exhibition of *Apamea secalis.* Messrs. Buckstone, Pennington, Mera, Turner, Tonge, B. Adkin, etc., exhibited series; and Mr. Tams introduced the subject with a series of notes, as follows :—

" *Apamea oculea*, Linn.—It falls to my unenviable lot to-night to introduce to you the subject of variation as manifested in a veritable Proteus among our Palaearctic moths. On your part, you are expecting to hear something about *Apamea oculea*, Linn. When I agreed to say something about this interesting insect, I failed to realise, that not only did I know nothing about it, but also that I should fail completely in the time at my disposal to adequately grasp the intricacies of the subject. At the present moment, in spite of Mr. Durrant's valuable assistance, I feel quite unable to present to you a proper statement of the relationships between the various names which have been associated with this moth during the last seventy years.

" With regard to the proper name of the insect, therefore, let us accept at once what appears to be an incontrovertible fact, *viz.*, that the true name is *secalis*, Linn. I give you the trivial name only to begin with, because I find it quite impossible, without great labour, to discover what is the correct generic name to associate with it. I will mention that matter again later on. Although it seems probable that Linnaeus neither saw the insect nor recognised it as anything known to him, the description which he gives is quite sufficient to enable us to recognise accurately the moth to which it refers. I will read you the original description : '*secalis* Phalaena Noctua spirilinguis cristata, alis deflexis : superioribus griseo-fuscis striatis : macula reniformi A latino.' Now it seems beyond reasonable doubt, that, as Linnaeus gives a reference to Rolander's description of 1752, he simply took this description, modified it slightly to suit his taste, and incorporated it in his 'Systema Naturae,' ed. X. Colour is lent to the suggestion that Linnaeus never recognised the species to which the description referred, by the fact that in his 'Syst. Nat.,' XII., he placed *secalis* in *Pyralis*, and described another form of the same moth under the name *oculea*. This form clearly did not possess the Roman 'a.' Schöyer in the 'Stettiner Entomologische Zeitung,' 1879, deals with the whole subject, and states that in 1874 Wallengren treated *secalis*, *oculea*, and *didyma*, Esp., as the same species. Previously, in 1864, Werneburg dug up *secalis*, and pointed out that Linnaeus's description was founded on Rolander's, and all this is confirmed by Schöyen. Werneburg also deals with the other names concerned, and incidentally mentions two names which are omitted by Hampson from his synonymy of *secalis*, and which, as I do not know exactly to what they refer, I will pass over. Some day I hope we shall be able to write down correctly the whole synonymy, to adopt permanently the name *secalis*, and then to forget for ever the rest. With regard to the trivial name *secalis*, I should like to say here, that you will find it adopted, apparently correctly, by Staudinger, Hampson, South, and Warren.

"Now with regard to the generic name. This we cannot settle without much diligent searching, but I should like to give you an idea of what is the present value of some of our generic names to-day. I need only mention a few of the works best known to English lepidopterists. Tutt, in his 'British Noctuae,' calls the species *Apamea didyma*, and this is followed later by South. Hampson, in the 'Moths of the Fauna of British India,' calls it *Euplexia didyma*. Meyrick, in his 'Handbook,' calls it *Hadena didyma*, Staudinger calls it *Hadena secalis*, Hampson in his 'British Museum Catalogue' calls it *Trachea secalis*, whilst Warren in Seitz gives us *Parastichtis secalis*. I am here bound to confess that I am a little staggered at the task before me, *viz.*, that of attempting to straighten out this tangle. Given the types of the genera as cited by Hampson in his 'Catalogue,' though, as many of you know, Hampson's treatment of type citations is not above criticism, I feel quite safe in saying that any one of you would find no little difficulty in fitting *secalis* into one of these genera. For my own part, to avoid clashing with Hampson's treatment of *Apamea*, I am compelled for the present to adhere to the *Trachea* of the 'British Museum Catalogue,' but I do not wish to give you the impression that I for a single moment entertain that as the correct interpretation, force of circumstances merely driving me to avoid upsetting the whole house of cards, before I have a definite foundation on which to rebuild. So much for the genus.

"Now we come to the business of the evening, you will say. I do not, however, propose to go deeply into the question of the variation. I fear that I am not in any way the person who should be talking to you about the variation of *Trachea secalis*, Linn. The remarkable diversity of form presented by this moth is certainly of great interest, but this interest for me lies more in the fact that the insect does vary, and in the question 'Why does it vary?' than in knowing how many varieties there are, or in naming, cataloguing, and classifying them. There is abundant opportunity for research in our subject, and I for one greatly deplore the tendency, which I have observed in the work of many entomologists to-day, to occupy themselves largely with the accumulation, and what in my humble opinion is becoming almost a tragedy, the prolific naming of varieties. It seems to me that by far the most valuable work to be done on variation can be done through breeding, and, whilst I fully recognise the immense value of large accumulations of material illustrating variation, I cannot see what good purpose is being served by those who spend their valuable time in naming and describing varieties and aberrations.

"Tutt, in his 'Varieties of the Noctuae in the British Islands,' gives us a very comprehensive treatment of the varieties of what he calls *Apamea didyma*, Esp. He gives a classification of some 30 varieties, and he says: 'This is as complete a classification as I can make. Incidental varieties, especially of colour, will undoubtedly occur, but I do not feel justified in dealing with the species except in the most general way. Most of the varieties, fortunately, have been named in the first instance as distinct species.' I tremble to think what would have been the result had Tutt dealt with this species in the *most detailed way*.

"In passing, although I am not a Latin scholar, I should like to point out what seems to me to be an unusual method of forming names. Tutt has, for example, formed the compound *grisea-albo*, affixing the *Ablative* of *albus* to the existing adjective. He did not do this in his 'British Lepidoptera,' and I should like to know why he did it in the first instance, or why he gave it up later.

"Since Tutt's work on this species I believe very few new varieties of this species have been described. I find two in Seitz, *pulverosa* and *lilacina*, described by Warren. From the descriptions it would seem that these do not agree with anything in Tutt's list.

"Before concluding my short introduction to the subject, I should like to make one or two remarks on my conception of the terms in use, and also to draw attention to a point which has at different times been suggested to me by various people.

"In the first place, there appears to be some inconsistency in the use of the terms, subspecies, form, variety, aberration. 'Subspecies' seems to have a definitely accepted meaning with the majority of zoologists, *viz.*, geographical race. Some authors, however, do not use it in this sense, but rather for certain forms, which in their opinion are not entitled to specific rank. The term 'form' seems to be used for a variation, which is not geographically limited, but is limited by some other factor, for example, a seasonal variation may be defined under the grade '*form*.' Whether I am correct in this interpretation I shall perhaps discover later on in the discussion. The term 'variety,' as I interpret it, from the general use to which it is put in this country, is applied to a variation which is well established, occurring, generally speaking wherever typical examples occur, and not limited by any factor which may determine a 'subspecies' or a 'form.' 'Aberration,' in my acceptance of the term, denotes a sporadic example, which may occur along with typical examples, but usually turning up seldom, and in unexpected places.

"The other question, which occurs to me, is that of the application of such words as denote definite colour modifications occurring in many different insects. I refer to such words as *flava*, *flavescens*, etc. I fully realise the difficulty, owing to the existing combinations of these adjectives with generic names to form the valid specific names of many species, of establishing any new system of general usage of these terms. At the same time, I find that many workers, including Tutt, use as varietal names for species in the same genus, these words descriptive of colour grades. For example, Tutt gives *Hydroecia nictitans* var. *pallida* sub var. *pallida-flavo*, and also *Hydroecia lucens* var. *pallida* sub var. *pallida-flavo*. Here then we have a question which must be faced at some time. That it will not be satisfactory to have two subspecies with the same name, belonging to two different species in the same genus seems to me a reasonable view to take. But are we to extend this principle to varieties, subvarieties, and aberrations. If so, then it will necessitate the changing of many varietal and aberrational names.

"I fear that I have brought in a number of questions which may induce a more general discussion than was originally intended, but at the same time, I must plead that my own intention in thus dealing with the subject is to draw to your notice the crying need for a drastic reduction in the now all too prevalent multiplication of varietal and aberrational names, and for a closer application to the accurate identification of species and subspecies, and the settling of the vast number of nomenclatural difficulties with which systematic workers are repeatedly confronted. The discussion of the actual variation I leave with you, and if, as I am inclined to believe, though I hope I am wrong, the variation of this moth does not present sufficient basis for a good discussion, perhaps some of the points I have raised may serve to stimulate discussion, which may be even more profitable than that which might have arisen out of the mere revision of the facts of this remarkable instance of variability."

A short discussion took place.

MAY 24th, 1924.

FIELD MEETING—HORSLEY.

Conductors, Messrs. F. B. CARR and HY. J. TURNER, F.E.S.

It had been intended to take a route unknown to the Society hitherto, but in consequence of several very rainy days preceding the meeting, it was considered by the Conductors that some portions might be impassable, especially as heavy rain was threatening when leaving the station. Most of the time spent in the woods and lanes was in the rain; and there was little to be done entomologically. The only species reported were *Tephrosia punctularia* in some numbers on the stems of small birches on Netley Heath, which is now much overgrown: a specimen of *Hamearis lucina*, stirred up on the Leas, and a *Drepana binaria*. Only on reaching the hostelry for an early tea did the rain finally cease, and the sun gleam fitfully, though too late to be useful.

Mr. Step, however, reported that, with Mr. C. B. Tahourdin (visitor), he had enjoyed quite a good time in the search for Orchids. The Bird's-nest (*Neottia nidus-avis*) was particularly abundant, as was the Twayblade (*Listera ovata*); and in one thicket there were more of the Fly (*Ophrys insectifera*) than he had seen together previously. The White Helleborine (*Cephalanthera latifolia*) was plentiful under the beeches; and, though not in flower, there was a great number of the Broad-leaved Helleborine (*Epipactis helleborine*). A few of the large Butterfly (*Habenaria chloroleuca*) were out in their usual stations. Several fine clumps of the Toothwort (*Lathrea squamaria*) were pointed out near the cottage.

JUNE 12th, 1924.

Mr. T. H. L. GROSVENOR, V.-PRESIDENT, in the Chair.

Mr. Blenkarn exhibited the following Coleoptera: *Calosoma inquisitor*, New Forest, May 29th, 1924; *Carabus granulatus*, Wicken, May 21st; *Rhagium indigator*, Aviemore, September, 1923; *Apoderus coryli*, Darenth Wood, June 3rd, 1923; *Gonodera* (*Cistela*) *luperus*, Box Hill, May 25th, 1924; *Tillus elongatus*, Mickleham, June 3rd, 1922; and *Grammoptera variegata* (*analis*), Ashtead, June 4th, 1922.

On behalf of Mr. Goodman, he also exhibited the extremely local species, *Leptura cerambyciformis*, from its only known British locality, Chiddingfold; also *Melasoma populi*, from Tilgate Forest.

Mr. R. Adkin exhibited webs of the larvae of the Tinea *Butalis grandipennis*, on the small furze (*Ulex nanus*), collected near Laughton, in March and April last. He said that although the webs were very plentiful very few of them contained larvae.

Mr. Sims exhibited a specimen of the Coleopteron *Agapanthia villosoviridescens* (*lineatocollis*), and the ova of *Papilio machaon*, both exhibits from Wicken.

Mr. S. N. A. Jacobs exhibited a pair of protectively coloured bugs (Hemiptera) from Saskatchewan, with ova and freshly emerged young.

Mr. K. G. Blair exhibited the "fire-fly," *Pyrophorus pilucidus*, from Trinidad, sent to him by Dr. Withycombe, and stated that both sexes were luminous; the males came to light but the females never; their time of flight was after dark; the sexes differed in their method of exhibiting their light; a group of females was frequently met with; they fed readily on sugar-cane and they nibbled at each other, some having tarsi deficient as a consequence; when placed on their backs the ventral light could be well seen.

Mr. A. W. Dennis exhibited the filmy fern, *Hymenophyllum wilsoni*, from N. Wales. Mr. Step called attention to the similarity of the spore capsules, situated in the axils of the segments of the frond and opening by valves, to the seed vessels of phanerogams.

Dr. Cockayne exhibited the larva of *Tricopteryx* (*Lobophora*) *polycommata* from an ovum.

Mr. A. E. Tonge exhibited the larva of *Taeniocampa miniosa* feeding on bramble, from Chiddingfold. The species usually fed upon oak.

Mr. T. H. L. Grosvenor exhibited a case containing most of the species of *Zygaenidae* which are found in N. Africa, Asia Minor, and Turkestan.

Mr. Goodman exhibited *Anthocharis falloui*, *A. belemia*, and *A. eupheno* (*belia*), sent to him by Professor Lister from Algiers, in the spring.

Several members testified to the general scarcity of insects this year, up to the present time.

JUNE 14th, 1924.

Field Meeting—Chalfont Road.

Conductor, Mr. F. B. Carr.

The day was very pleasant and sunny, and most of those who wished were able to take a few of the special species of that well known locality, *viz.*, *Asthena blomeri*. *Abraxas sylvata* (*ulmata*) was as usual at this date, in quantities, a beautiful sight of "bird's dirts" on the leaves of the Dog's Mercury (*Mercurialis perennis*), beneath the tall trees and nut-boughs. Many other species of Lepidoptera were noted, but as this area has been reported on again and again, it is needless to repeat the list.

Those present were subsequently entertained at Chorley Wood, by Mr. and Mrs. T. W. Hall, who had most kindly again invited the members to a substantial meat tea. This thoughtful act on our old fellow member's part was much appreciated.

JUNE 26th, 1924.

Mr. T. H. L. Grosvenor, F.E.S., Vice-President, in the Chair.

Mr. C. G. Priest, of Notting Hill, was elected a member.

Exhibition of Living Objects.

Dr. Fremlin exhibited specimens of the white helleborine (*Cephalanthera latifolia*) and of the fly-orchis (*Ophrys insectifera*), from near Berkhampstead in the Chiltern Hills. It was remarked that the former was very abundant in many places this year, but that for some years the latter had been very scarce.

Dr. Cockayne exhibited a larva of *Lampropteryx suffumata*. A batch of eggs was laid in mid-May, and the larvae emerged about June 5th.

Mr. K. G. Blair, on behalf of Mr. Blenkarn, exhibited a green cockroach, *Panchlora virescens*, with a family of young, on a piece of banana. The young were not green but brown. It was a native of Jamaica.

Mr. Hy. J. Turner exhibited examples of the pupal habitations of *Dictyopteryx bergmanniana* among the leaves of the wild rose. He showed that the leaves were in every case curiously and regularly folded together on a very definite plan, and that the leaves used were never those which had been damaged by the larva feeding upon them. The normal rose-leaf consists of five leaflets, that is two pairs and a terminal leaflet. This terminal leaflet is folded at the midrib to form the pupal chamber; of the next pair of leaflets the proximal half of each is attached to the pupal chamber on each side, the other half of each of these leaflets being either attached to its fellow leaf, extended at right or some other angle, or folded back below the pupal chamber. There is no wrinkling nor cross folding of these leaflets. In some cases the terminal leaflet (pupal chamber) extended considerably beyond the side leaflets, in others it was enclosed between them ; this depended upon the longer or shorter petioles of the leaflets.

Mr. E. G. Bunnett exhibited larvae of *Saturnia pavonia*, *Cucullia verbasci*, and *Notodonta ziczac*, and specimens of the man orchis (*Aceras anthropophora*), the fragrant orchis (*Habenaria conopsea*), and the yellow balsam (*Impatiens parviflora*).

Mr. Sims exhibited the young larvae of *Papilio machaon* ; and imagines of the Coleopteron, *Chrysomela graminis* with ova, from the fen district.

Mr. Blenkarn exhibited a series of *Bembidion schüppeli*, taken by Mr. H. F. Day by the river Irthling, in Cumberland, on June 7th, 1924; the black form of *Carabus arvensis*, from Honister Pass, Cumberland, with Killarney forms for comparison, taken on June 10th; *Geotrupes vernalis*, taken at Keswick, June 3rd; and *Epipolaeus caliginosus*, taken by Mr. Duffield Brook, near Ashford, Kent, on May 18th, 1924.

Mr. Priest exhibited a very perfectly halved gynandromorph of *Amorpha populi*, bred in June, 1923.

JULY 10th, 1924.

The President in the Chair.

Mr. Stanley Edwards exhibited species of the genus *Erebia*, taken by him some years ago on the southern slopes of the Alps, including a series of the local *Erebia flavofasciata*.

Mr. Robert Adkin exhibited egg-masses of the fresh-water snail, *Limnaea stagnalis*, attached to the under surface of the leaf of a water-lily. He said that the eggs are deposited in a gelatinous mass, usually about an inch to an inch and a quarter long, by about

$\frac{3}{16}$ of an inch in diameter, and in shape much resembling a colourless leech; they are attached to the underside of the leaves of water plants, or to their stems, or even to other underwater plant debris. When first deposited the eggs are practically colourless, and it is difficult to distinguish them from the gelatinous mass in which they are enclosed, but as they mature they darken in colour and are then easily seen as almost black specks, evenly distributed throughout the interior of the mass. In the spring of 1923 he introduced a few snails of this species into a small fountain pond in his garden, where they bred freely, and were found to be very useful in keeping down the green confervae, which is often very troublesome in such ponds, and which appears to be their chief food; he had not observed them to attack larger water plants.

Mr. Enefer exhibited a specimen of *Sesia* (*Macroglossa*) *stellatarum*, taken at Blackheath on June 23rd.

Mr. Farmer exhibited specimens of *Zygaena filipendulae*, bred from cocoons taken at Eastbourne; and remarked on their unusually small size, and tendency to imperfect development; one specimen had the left hindwing not developed, another had no right forewing and in another the hindwings were of a very light red.

Mr. E. Step exhibited the living apterous female of *Methoca ichneumonoides* (Hymenop.), bred from a cocoon (also shown), one of several found by Mr. Priske and himself at Swanage. The cocoon is a low cone, circular, with a base diameter of 7mm., red-brown, and of glazed membranous texture. They were found attached to the underside of chalk blocks at the foot of a cliff. The insect is believed to parasitise moth larvae; and the finding of these cocoons indicates that the larva vacates its victim before pupating.

Mr. Hy. J. Turner exhibited the living larvae of *Hypena rostralis*, found in some number feeding on hop growing in his garden at New Cross; and remarked on the curious habit of the larva, on being disturbed, of dropping suddenly from its food-plant, curling rapidly in several ways and shooting itself in direct line for several inches, afterwards remaining extended as if exhausted. It was remarked as being a somewhat common species in the suburbs of London where hop occurs in gardens.

Mr. T. H. L. Grosvenor exhibited a short series of *Teinopalpus imperialis* from Sikkim, including the scarcer female; also four *Armandia lidderdalii* from the Naya Hills, in Bhutan.

Mr. A. E. Stafford exhibited a specimen of *Heodes* (*Rumicia*) *phlaeas*, in which the markings of the left forewing underside were reproduced on the left hindwing, the right hindwing being normal (Homoeosis). It was taken near Barnes. He also showed a smoky aberration of *Arctia villica* from Reigate.

Mr. Edwards reported the capture of *Heliothis peltigera* at Blackheath, Mr. R. Adkin remarked that he had seen *S. stellatarum* along the front at Eastbourne, in July; and the President stated that he had found *Papilio machaon* fairly common on the Norfolk Broads.

JULY 19th, 1924.

FIELD MEETING—ALDERSTEAD HEATH.

Conductor, Mr. HY. J. TURNER, F.E.S.

This was a new locality to all those present. Train was taken to Coulsdon, and thence the walk was over Farthing Down, where many micros were obtainable in the short grassy undergrowth, and a few larvae from the skirt of broad hedges. The continuation was along the beautiful sheltered lane to Chaldon Church, where the usual Geometers were easily disturbed. From here field-paths were taken which came out on a secluded common, partly heath-covered, partly rank grass, partly with various bushes and gorse, partly wooded with oak in places and larch in others. Here the party dispersed and were soon lost to one another. Some even going about half a mile further to the face of the chalk downs above Merstham. In late afternoon the welcome tea was obtained at a convenient tea house on the main Brighton Road below. A very promising and convenient area was thus shown to the members present.

JULY 24th, 1924.

The PRESIDENT in the Chair.

Dr. Cockayne exhibited living larvae of the two elephant hawkmoths, *Eumorpha elpenor* and *Theretra porcellus*, feeding on *Galium uliginosum*; of the bee-hawk, *Hemaris fuciformis*, on honeysuckle; of *Sesia* (*Macroglossa*) *stellatarum* on *Galium verum*; of *Epione advenaria* and *Geometra vernaria*. Of the last species both the brown and the green form of the larva were shown, feeding on Clematis.

Mr. R. Adkin exhibited a specimen of *Dianthoecia compta*, and contributed the following note:—In the summer of 1920 a number of seed heads of Silene were collected on the Downs a few miles out of Lewes, and from them, in the following June, several specimens of *Dianthoecia conspersa* (*nana*) were reared. One of them differed considerably from its fellows and was regarded as a rather nice variety of that species, and as such stood in my cabinet until a few weeks ago, when a friend who was looking at the series suggested that it looked very like a *compta*. My attention thus called to it more seriously than it had been previously, I compared the specimen with Hubner's figure of *compta*, and found it to agree in every detail. I then took it to the Natural History Museum, where I was able to compare it with series of that species, with which it also agreed very closely. The specimen being a female, a comparison of the genitalia with Pierce's figures was not possible, but on examining the secondary characters of a number of females of the two species Mr. Tams pointed out that there was a considerable difference between them, and that my specimen in this respect also agreed with those of *compta*. The occurrence of the species in Britain has been surrounded by so much mystery, owing chiefly to Haworth having unfortunately described *conspersa* under the name of *compta*, that one needs to approach the subject cautiously; but on the evidence given above I have no hesitation in exhibiting this specimen as a veritable British *compta*.

Mr. Hugh Main exhibited various items brought by him from Corsica, including several wingless beetles, known locally as "Akis," which feed upon human excrement; a *Hister* sp., taken amidst horse-dung, which feeds upon dipterous maggots; a large *Scarabaeus* beetle, not *S. sacer*, but probably *S. poeas*, which was numerous at Evisa, where many nests were found containing the interesting "pear" masses; a large Longicorn beetle, found in some number in beech logs, near Vizzavona, and which stridulated readily.

Mr. Hy. J. Turner exhibited short series of *Parnassius discobolus* with its form *romanovi*, and *P. delphius* with its race *albulus*, both from Narynsk, in Turkestan, at a height of about 12,000 ft.

Mr. Coulson exhibited a short series of the beetle *Rhagium bifasciatum*, taken among cut pines and firs at Peaslake, towards evening, on May 20th. All the specimens showed aberration of markings, including one in which the whole surface of the elytra was of a creamy white colour. Mr. Ashby said that such variety of marking in the species was unknown to him. He also showed *Melanophila acuminata* from Wimbledon, a species usually found in the presence of burning forest timber.

Mr. T. H. L. Grosvenor exhibited a series of the Indian *Papilio polytes*, showing its polymorphism. The ♂s are constant black and white. The first form of the ♀ is like the ♂, black and white, the second form has numerous red markings, and mimics that of *P. hector*. The third form of ♀ has white markings and mimics the ♀ of *P. aristolochiae*.

AUGUST 10th, 1924.

FIELD MEETING—LEWES.

Conductor, Mr. T. H. L. GROSVENOR, F.E.S.

This was one of the best days of the year, and certainly hot. The area mainly worked was the slopes and tops in and around what is known as "Bible Bottom," an extremely steep hollow to the east of the town, which can be more easily reached by the knowing ones through the private passage of a hostlery, than by climbing up and over the high down. The "blues" were conspicuous by their almost total absence, two or three wandering *Colias croceus* (*edusa*) were taken, and other odds and ends. The only species in any number was *Aspitates ochrearia* (*citraria*), but were not easy of capture on the very steep slope. *Botys flavalis*, which usually occurs at this date on the same slope was entirely absent.

AUGUST 14th, 1924.

Mr. T. H. L. GROSVENOR, F.E.S., VICE-PRESIDENT, in the Chair.

Dr. Cockayne exhibited the larva of *Cucullia umbratica* feeding on dandelion; he stated that the ova were laid quite loose.

Mr. Robert Adkin exhibited a strongly banded form of an *Eupithecia*, which he thought referable to *E. satyrata*. It appeared to be intermediate between the Shetland var. *curzoni* and the type; it was taken in Sussex.

Mr. Hugh Main exhibited (1) an *Empusa* species brought by Mr. Goodman from Digne; (2) a stridulating beetle, *Passalus* sp., from

Trinidad, sent to him by Dr. Withycombe: it occurs in colonies in the rotting trunks of trees; (3) a Syrphid (Dip.) larva found attached to a larva of *Cucullia gnaphalii*, which it was sucking, sent to him by Mr. E. P. Sharp, of Eastbourne; it was given two small larvae of *Amorpha populi*, which it has since sucked dry.

Mr. S. A. Blenkarn exhibited a series of *Agonum sexpunctatus* (Col.), from Oxshott. This species has been taken somewhat freely in the Crowthorne pine area, and now, since the trees at Oxshott have been cut, and many pieces of their wood have fallen over the damp ground, this beetle has occurred there.

Mr. H. W. Andrews exhibited the Dipteron, *Trypeta tussilaginis*, found on burdock in N. Kent, in July.

Dr. Fremlin exhibited a *Pieris napi* taken at Hendon in early July, in which the veining of the underside was exceptionally dusky for a specimen presumably of a second brood.

Mr. K. G. Blair exhibited *Crabro vagus*, L., and its prey; and contributed the following note:—"On July 13th, at Charmouth, Dorset, a ♀ of this species was found in its burrow in a piece of fallen bough of ash. On investigation the burrow was found to consist of two cells, the first still open and apparently not fully rationed; no egg was present. Its contents were *Scatophaga stercoraria*, 2 ♀s, *Musca corvina*, 3 ♂s, *Nyctia halterata*, 1 ♀, *Loxocera aristata*, 1 ♀. The cell behind it contained the following: *Haematopota pluvialis*, 5 ♂s, *Musca corvina*, 3 ♂s (one with egg of *Crabro* attached), *Pollenia vespillo*, 1 ♀, *Scatophaga stercoraria*, 1 ♀, *Herina afflicta*, 2 (sex uncertain).

"In a second burrow in the same piece of bough was a single completed cell, containing *Haematopota pluvialis*, 4 ♂s (one with egg of *Crabro*), *Musca corvina*, 1 ♂, *Herina afflicta*, 1, *Empis*, sp. 1.

"The difference in the bulk of the contents of the two completed cells (presumably the work of the same species, and probably of the same ♀) is very remarkable. Noteworthy, too, is the apparent preference for certain species of Diptera, and the selection of one sex only of these, *e.g.*, *Musca corvina*, 7 specimens, ♂, in 3 cells; *Haematopota pluvialis*, 9 specimens, ♂, in 2 cells; *Scatophaga stercoraria*, 3 specimens, ♀, in 2 cells. This latter feature is probably to be accounted for by the habits of the Diptera in question. *Herina afflicta*, for example, was in some numbers on the blades of a bed of *Iris pseudacorus* close by, to which also the *Musca* and *Scatophaga* were resorting, so that possibly these species were hunted in this Iris bed. No *Haematopota*, however, were observed upon them, though the ♂ s of these Tabanids are sometimes found at rest upon leaves. On this occasion no ♂ s were seen in this vicinity, though the ♀ s were unpleasantly numerous. On another occasion the ♂ s of this species were observed sporting in company in the air 8-12 feet up, so that their presence among the booty gives no indication as to whether they were hunted standing or on the wing. Another specimen of the same species of *Crabro* had been previously captured on a head of *Heracleum*, but whether in quest of the Diptera attracted there was not noted. In both cases where the sausage-shaped egg of the *Crabro* was present, it was attached by one end beneath the neck of the fly and curved around the left side of the neck."

Messrs. O. R. and A. de B. Goodman exhibited the larva, pupa, and imago of three of the European species of *Papilio*; *P. alexanor* from Digne, *P. hospiton* from Corsica, and *P. machaon*; and pointed out that the two latter, although closely allied, were quite distinct.

Mr. Hy. J. Turner exhibited male and female specimens of *Melanargia titea* from Syria, with examples of the somewhat smaller and more sparsely marked form *palaestinensis*, Stdgr., from near Jerusalem, with a remarkable aberration in which the usually well-marked eye-spots on the hindwing, both sides, were only partly represented by a few dots, while the apical eye-spots on both sides of the forewings were entirely absent.

He also showed a series of *Anthocharis belemia*, typical forms from Algeria and the summer form *glauce*, with sparser and more suffused yellow marking on the lower wing below, from Gibraltar; and a somewhat similar but more sparsely marked summer form, *palaestinensis*, Röber., from Palestine; another specimen from Palestine, undated, was apparently a spring form having increased area of the greenish markings, with less yellow suffusion on the underside.

Mr. Farmer exhibited some *Zygaena filipendulae*, bred from Eastbourne-collected cocoons; and stated that the first specimens to emerge were large in size, those later were smaller, but that those which emerged last were again large.

AUGUST 28th, 1924.

Mr. E. J. Bunnett, M.A., Vice-President, in the Chair.

Dr. E. A. Cockayne exhibited the living larvae of *Eupithecia* *subnotata* and of *Hadena* (*Mamestra*) *trifolii* (*chenopodii*), both feeding on the common *Atriplex*, and living larvae of *Mesoleuca ocellata* feeding on *Galium*.

Mr. T. H. L. Grosvenor exhibited a large number of specimens of *Melanitis leda* (*ismene*), an extremely common Satyrid in South and East Asia. While more or less stable in marking on the upperside, the underside is excessively variable, scarcely any two specimens being alike. The full wet season form has a complete series of beautiful and conspicuous eye-spots on the underside, while the full dry season form often has no trace. Intermediates of every grade in number, size, colour, and development of eye-spots exist. The ground colour and scattered markings over this surface are also of infinite variation. Mr. Grosvenor said that, in his experience, the species normally flies at dusk, especially at mango flowers He had even seen it at midnight; it appeared to shun sunlight and never came to light at night. The species name is usually *leda*, but *ismene* is the prior name given to a dry season form by Cramer, while the first name for a rainy season form was *determinata*, given by Butler.

Mr. Hy. J. Turner exhibited living larvae of *Abrostola triplasia* and of *Eupithecia assimilata*, found feeding on hop in his garden at New Cross. In the neighbourhood of London he had several times found that the planting of hop in a garden invariably brought the latter species.

Mr. A. W. Dennis exhibited a photograph of the fruit of the Musky Storks-bill, *Erodium moschatum*, showing the peculiar mode of dispersal of the seeds.

Mr. Enefer exhibited larvae and pupae of *Hipocrita jacobaeae* from Alum Bay, I. of Wight, and also a female of the spider, *Theridion lineatum*, carrying its green bundle of eggs, found on a plant of the Mullein, *Verbascum thapsus*, at Ventnor, I. of Wight.

Mr. Robert Adkin exhibited a number of specimens of *Zygaena filipendulae*, which he had bred from pupae collected, or had captured near Eastbourne; and read the following note:—

On June 28th last I collected about a couple of hundred pupae of *Z. filipendulae* on the lower slopes of the Downs: they were all taken within a space of about sixty square yards, and the difference in elevation between the highest and lowest part of the area on which they were taken was not more than two or three yards. A great deal has been said at one time and another about large lowland races and small races of the Down-lands; it is therefore interesting to note that among the specimens exhibited there is a variation in size from 38mm. to 30mm. If the measurements, 35mm. to 28mm., given by Meyrick in his handbook may be taken as a standard, it will be seen that the larger of those bred exceeded the maximum by 3mm., and the smaller came within 2mm. of his minimum. Variation in pattern was not very remarkable, a few specimens had the two outer spots united, and a still smaller number the median pair also. In one specimen the upper spot of the outer pair and the lower spot of the median pair were of an irregular crescent shape on both wings. An asymmetrical specimen had the right wing normal, but on the left wing the lower spot of the median pair was distinctly crescent-shaped with a large lobe projecting outward from it; there were also two additional small spots, the one placed just beyond the lower and the other just internally to the upper on the disc of the wing. One captured specimen had *achilleae*-like markings, in that the upper part of the basal spots were greatly extended along the costa, and the outer pair united into an irregular triangular blotch.

Mr. Adkin also exhibited a short series of *Acidalia immorata*; and said that he was pleased to find that this much-hunted species was still fairly plentiful in its restricted haunts at the tail end of Ashdown Forest.

Mr. S. R. Ashby exhibited specimens of the Coleopteron *Nebria livida*, which he had found in some numbers in clay banks near Cromer, in June. It was an extremely local species, and in Fowler's "Coleoptera of the British Isles," Bridlington was given as the only other locality.

Mr. K. G. Blair exhibited living specimens of both sexes of a species of Psocid, *Caecilius corticis*, recently described as new by Mr. Pearman, in the May number of the "Ent. Mo. Mag." Mr. Blair's specimens came from Hendon.

SEPTEMBER 11th, 1924.

The PRESIDENT in the Chair.

Mr. O. R. Goodman exhibited *Melitaea didyma* ♂ and *M. phoebe* ♀, taken *in cop.*, on August 23rd, 1923, at Reazzino, Ticino, Lake Maggiore, Switzerland.

Mr. Hy. J. Turner exhibited the living larvae of *Acronicta leporina*, beaten from birch at Westerham, showing the pre-final and final stages ; also larvae of *Drepana falcula*, of which he had found ten examples on one small birch bush at Chiselhurst ; and called attention to the partly curled leaf, which was used by day as a shelter.

Mr. E. Step exhibited Fungi from Box Hill, including the beautiful buff-coloured *Clavaria formosa* ; the tall, stalked puffball *Calvatia saccata* ; the fringed-mouthed earth-star, *Geaster fimbriatus* ; and the horn of plenty, *Craterellus cornucopioides*. He stated that the beech-woods of the Box Hill Extension, on either side of Juniper Bottom were, on the previous day, rich in Fungi in great variety and excellent condition.

Mr. Priest exhibited an *Arctia caia*, bred at Willesden, in which the black spots on the hindwings were united into a wide irregular submarginal band.

Dr. Cockayne exhibited the living larvae of *Plusia chrysitis*, of *Amorpha populi*, the spotted form, and of *Manduca atropos*. The *P. chrysitis* had attained considerable growth, and it was suggested that it might possibly pupate and not hibernate as is usual.

Mr. Jacobs exhibited a specimen of *Tortrix unifasciana*, taken at Catford on September 7th, a rather late date and suggestive of a second brood.

Mr. Dennis reported that *Senecio viscosus*, usually a rather local plant, had occurred on waste ground at Westminster. He also stated that the naturalised *S. squalidus* was quite abundant on the railway banks in N.W. London, particularly at Shepherds' Bush.

Mr. Sims exhibited a teratological specimen of *Aeschna grandis*, in which the third leg on the right side, although quite perfect in all its parts, was extremely dwarfed in size. He also showed the Hemipteron, *Piezodorus lituratus*, taken from furze bushes.

Mr. Riley exhibited a pair of the magnificent new *Ornithoptera*, *O. titan*, of which only one ♂ and two ♀ s have so far been captured. The species comes from the headwaters of the Kikori River, Delta Division, Papua, and is a near ally of *O. joiceyi*. It was collected by Mr. De Verteuil. The male exhibited was stated to have been captured by a native boy and brought to the collector between some large leaves. It was in remarkably good condition.

Mr. Dunster exhibited a box of ♀ aberrations of *Polyommatus icarus*, including ab. *obsoleta* underside of f.w., enlarged spots ditto, with emphasised veins ditto, and one with white streaks on the hindwings above.

Mr. Hodgson exhibited a series of striking aberrations of *Polyom-*

matus (*Agriades*) *coridon*, undersides characteristic of the well-known Royston area, including grades of obsolescence and striation, and clay-coloured examples.

SEPTEMBER 13th, 1924.

FIELD MEETING—WESTERHAM.

Conductors, Messrs. F. B. CARR and HY. J. TURNER, F.E.S.

This turned out a very pleasant day in spite of the previous spell of inclement weather. Those present devoted themselves mainly to larvae-beating, and were more successful than usual this most unfavourable year. In and around the High Chart, towards Limpsfield, the following species were obtained :—*Dasychira pudibunda*, *Demas coryli*, *Gonodontis bidentata*, *Pachys betularia*, *Geometra papilionaria* (small), *Ephyra linearia*, *Cabera pusaria*, *Drepana lacertinaria*, *D. unguicula*, *D. binaria*, *Lophopteryx camelina*, *Phaeosia dictaeoides*, *Notodonta dromedarius*, *Cymatophora fluctuosa*, *Acronicta leporina* (5), *Triaena psi*, *Hylophila prasinana*, etc. Near the "Grasshopper" Trust House, where tea was arranged, was a very large colony of *Pieris brassicae* feeding on *Tropaeolum*, with here and there a stray *P. napi* among them. From the pines which could be reached there seemed to be plenty of larvae of *Bupalus piniaria*. There was certainly a scarcity of Micro-lepidoptera. Mr. Goodman found an adder near one of the rides.

SEPTEMBER 25th, 1924.

EXHIBITION OF OBJECTS OF NATURAL HISTORY OTHER THAN LEPIDOPTERA.

Mr. T. H. L. GROSVENOR, F.E.S., VICE-PRESIDENT, in the Chair.

Mr. Robert Adkin exhibited specimens of the Collembola, *Podura aquatica*, L. He said that the insect was very common in his garden at Eastbourne, both on the surface of water in a small pan that was placed out for the benefit of the birds, where it congregated in masses often a full inch across; and in a cucumber frame, where the chief place of assembly was along the sides of the midrib of the leaves of the plant. The creature runs fairly rapidly and has considerable jumping powers; it appears to feed upon the cucumber leaves, and sometimes the skin of the fruit.

Mr. W. J. Lucas exhibited coloured drawings, from life, of the naiads of the Dragonflies—*Aeschna juncea*, Linn., and *Agrion mercuriale*, Charp.—the former from Scotland, the latter from the New Forest; also an amusing illustration of "The Stag at eve had drunk his fill."

Mr. Hugh Main exhibited various living specimens taken recently in the South of France. (1) *Ephippigera* sp. (Orth.), ♂ and ♀, both sexes of which stridulate. Usually all the females are green and all the males brown, but he only saw one green female during his trip. As a rule the female finishes by eating the male. (2) Both sexes of two species of *Mantis*, one of which was *M. religiosa*. The females of these are also reputed to eat the males, but did not do so in this case; and Mr. Main suggested that probably this occurs only when the female is short of food. (3) The sacred scarab, *Scarabaeus sacer*, from Corsica, where they were very common near goats' dung. The curious "pears," balls of dung in which the egg is placed, and which serve as food for the larva. The pupa of the same was shown; and it was pointed out that the beetle has no tarsi on the front legs. (4) The larva of a *Myrmeleon* sp., probably *Palpares libelluloides*, which was not uncommon on the coast of the Mediterranean. (5) *Scorpio europaeus* and its moulted skin. (6) A female and her family of the large wolf spider, *Lycosa narbonensis*, a species made famous by Fabre's study of it. Fabre stated that the female continually rotates the egg mass, which she carries about with her. This Mr. Main had not observed. Her young when hatched mount on the mother's back and there remain. On a previous occasion the spider had been induced to leave its burrow by the insertion of a stout grass stem, but this time they were "fished" for by putting a young cricket on a string in the mouth of a burrow. (7) The banded spider, *Epeira fasciata*, with its egg cluster.

Mr. S. B. Williams exhibited the following species of Coleoptera: *Ceuthorrhynchus urticae*, *Cryptophagus ruficornis*, and *Stenus geniculatus*, from Harpenden; *Ceuthorrhynchus punctiger* and *Anthicus bifasciatus*, from Wicken; *Zeugophora flavicollis* and *Phymatodes alni*, from Bricket Wood; *Neuraphes sparshalli*, from near Luton; and *Lebia cyanocephala*, from Otford.

Mr. O. R. Goodman exhibited the brown form of the Viper, *Vipera berus*, L., taken on the occasion of the Field Meeting at Westerham, on September 13th. It measured 1ft. 10½in. in length.

Mr. S. R. Ashby exhibited a specimen of *Carabus intricatus*, taken by the late Mr. Reading, of Plymouth, in 1857. It came from Mr.

Blandford's collection, and was previously in Mr. Adam's possession. And a specimen of *Calosoma sycophanta* taken by the late Mr. Tugwell's son on the beach at Freshwater Bay, Isle of Wight, in 1873. It was in the late Mr. W. West's collection.

The almost complete collection of British Paraneuroptera (Dragonflies) belonging to the Society was on view.

Mr. H. W. Andrews exhibited a considerable series of *Eutolmus rufibarbis*, Mg., a scarce Asilid Dipteron, from N. Kent. The capture of the species was the only redeeming feature in a very poor season. He also exhibited a number of types of Diptera, *Anthomyiidae* and *Empidae*, which he was presenting to the Society's reference collections.

Mr. R. A. R. Priske exhibited series of forms of the land mollusca, *Helix itala*, *H. cantiana*, *H. arbustorum*, and *H. hortensis*, from High Wycombe, taken in September; also *H. acuta*, from Saddlescombe, Sussex, taken in September, 1923.

Mr. Stanley Edwards exhibited the giant Hemipteron, *Macroceraea* sp., from Tenasserim, and the very striking Lycaenid, *Lohita grandis*, taken by our fellow member Mr. W. G. Dawson, when over 80 years of age.

Mr. Enefer exhibited (1) A natural sport of a cactus dahlia, with a red flower and a yellow flower on the same stem; (2) An embryo of the cocoa-nut, (*Cocos mucifera*); and (3) An embryo of the date palm (*Phoenix dactylifera*).

Mr. L. E. Dunster exhibited an underside male aberration of *Polyommatus* (*Agriades*) *thetis* (*bellargus*), taken in Surrey, on August 31st, 1924. The forewings were striated, the hindwings normal except for the ground colour, which was whitish.

Mr. H. Moore exhibited various species of Ants, including *Camponotus herculeanus*, Linn., from Patras, the largest European species; *Camponotus abdominalis*, Fab., var. *stercorarius*, Fab., found on bananas at Lewisham; *Pallothyreus tarsatus*, Fab., from Nairobi, Kenya Colony, one of the stink ants; *Odontomachus affinis*, Guer., a slender species with elongated hooked jaws, from the Upper Amazon; *Paraponera clavata*, Fab., Amazon, a virulent stinger, mentioned by Spruce and others in varying terms; *Oecodoma cephalotes*, Linn., the well-known leaf-carrying ant; attention was drawn to the large winged ♀ eaten by the Amazon Indians, and the large hairy worker major, only found in the depths of the nest; *Eciton hamatum*, Fb., Amazon region, the too-well-known foraging ant;

average and long-jawed specimens were shown, and the ignorance of their life-history mentioned.

Mr. S. A. Blenkarn exhibited four boxes of Coleoptera from his collection containing :—

1. *Calosoma inquisitor* (New Forest), *Leistus montanus* (Arran), *Nebria complanata* (South Devon), *N. livida* (Bridlington), *Blethisa multipunctata* (Burwell Fen), *Panagaeus crux-major* (Wicken Fen), *P. quadripustulatus* (Deal), *Licinus silphoides* (Box Hill), and *Oodes helopioides* (Wicken Fen).

2. *Anisodactylus poeciloides* (Bembridge), *Amara fulva* (Lowestoft), *Pterostichus lepidus* (Glasgow), *P. oblongopunctatus* (Teesmouth), and *P. angustatus* (Crowthorne).

3. *Agabus labiatus* (New Forest), *Rhantus grapii* (Askham Bog), *Acilius sulcatus* var. *scoticus* (Arran), *Dytiscus dimidiatus* (Wicken Fen), *Gyrinus bicolor* (Wicken Fen), *G. urinator* (Reading), *Helophorus mulsanti* (Kirkbride), *H. laticollis* (New Forest), and *Hydrochus brevis* (Catfield, Norfolk).

4. *Agapanthia villosoviridescens* (Cambridge), *Stenostola ferrea* (Hartlepool), *Donacia clavipes* (Potter Higham), *D. dentata* (Wicken Fen), *D. braccata* (St. Osyth), *Orsodacna cerasi* (Forge Valley, York), *Cryptocephalus coryli* (Box Hill), *C. sexpunctatus* (Darn Wood), *C. bipunctatus* (Crowthorne), and *C. cristata*, a fine all copper variety from Coulsdon.

Mr. H. Willoughby-Ellis showed the following melanic specimens of British Beetles :—*Carabus nitens*, Semn., from the southern limits of the New Forest, and *Carabus arvensis*, Hbst., a very uniformly black specimen from Studland, Dorset; and said that it is a peculiar circumstance that so many of the black varieties of *Carabidae* should occur in the extreme south of England He also remarked on the number of species of beetles usually of maritime habits which occur in some inland localities. Of these he showed *Nebria livida*, F., from Staffordshire, which lives in clay cliffs in the same way as its more orthodox brethren on the East Coast. Other species such as *Harpalus picipennis*, Duft., *Broscus cephalotes*, L., and *Microzoum tibiale*, F., occur freely in the Mildenhall District. Also *Cteniopus sulphureus*, L., occurs plentifully at Oxford and other inland localities. If these inland representatives of a species have existed since the Geological period when these localities formed the sea coast and were left behind when the sea receded, which in many cases seems probable, it is proof of the very slow modification in form and colour of beetles by alteration in environment, although enormous periods of time must have elapsed since their natural habitat was available, as the specimens now obtained from the sea coast are indistinguishable from those which have so long been banished from the sea. In many cases, where powers of flight are very limited, or indeed absent, it seems extremely unlikely that the species can have spread by natural means to localities far from their usual haunts with large areas between, where the insects are not known to occur, such as in the case of *H. picipennis*. On the other hand, insects with moderate powers of flight could possibly spread over wide areas, in which case they might be expected to occur at intermediate places between their extreme ranges; but in most, if not all of the above mentioned instances, this is not the case. The most logical conclusion, therefore, seems to be, that many of the coast loving species have actually been left behind in remote Geological periods and now inhabit inland localities, and have continued to thrive with little or no modification, notwithstanding the severely altered conditions.

Mr. Harwood remarked that *H. picipennis*, quite recently, was common at Mildenhall, in the Breck area.

Mr. Blair suggested that these species were introduced in the remote areas rather than being the remnants of former conditions.

OCTOBER 4th, 1924.

Fungus Foray —Mickleham Downs and Box Hill.

Leaders, Messrs. H. Candler and E. Step, F.L.S.

Eight members and two friends took part in this ramble. The weather, which was gloomy and threatening at the start, gradually improved and the afternoon was calm and sunny. The top of the beech hanger along the edge of Mickleham Downs was explored, and yielded a rich harvest of fungi. The party then descended the hanger to Headley Lane, and thence proceeded up Juniper Bottom to the top of Box Hill, where they were joined by five others for tea at the Fort Tea-Gardens. Eighty-five species of fungi were noted, including the following interesting and uncommon ones :—*Lepiota clypeolaria*, *Tricholoma horribile*, *T. sulphureum*, *T. inamoenum*, and *T. grammopodium*; *Pleurotus corticatus*, *Hygrophorus chrysodon*, and *H. olivaceo-albus*; *Lactarius cilicioides*, *L. spinulosus*, *L. uvidus*, and *L. volemus*; *Cantharellus cibarius*, *Paxillus atro-tomentosus*, *Psalliota* *campestris* var. *silvicola*, *Stropharia aeruginosa*, *Bolbitius fragilis*, *Coprinus picaceus*, *Gomphidius viscidus*, *Polyporus betulinus*, *P. lacteus* and *P. adustus* var. *crispus*; *Clavaria pistillaris*, *Hydnum repandum*, *Craterellus cornucopioides*, *Hirneola auricula-judae*, *Phallus impudicus*, *Cynophallus caninus*, *Geaster minimus* (new to Britain), *Helvella lacunosa*, *Geoglossum glabrum*, and *Sepultaria sepulta*. The area visited on this foray has been recently traversed by the leaders separately, when the following additional, uncommon and beautiful fungi were discovered :—*Cortinarius bolaris* and *C. violaceus*, *Inocybe incarnata*, *Clavaria botrytes*, *C. formosa*, and *C. stricta*; and *Otidea onotica*. Amongst the flowering plants noted was the curious and rather local Ground Pine, *Ajuga chamaepitys*.

A few of the more ardent Lepidopterists spent most of their time in beating for larvae, which were fairly common. There seemed to be a fair quantity of the ordinary birch- and beech-feeding larvae, and from ragwort a few *Eupithecia* larvae were obtained.

OCTOBER 9th, 1924.

Mr. T. H. L. Grosvenor, F.E.S., Vice-President, in the Chair.

Mr. A. Lowther, of Ashtead, Surrey, was elected a member.

Mr. R. Adkin read a paper, "Entomology: Ancient and Present Day," illustrating his remarks with a long series of slides showing portraits of illustrious entomologists of the past, pages and plates from various works of old, and modern developments of the science.

At the conclusion Mr. Adkin presented to the Society the reading-stand fitted for the electric light, which he had used that evening.

Mr. Step exhibited the new British Earth-star (*Geaster minimus*) from Mickleham; and called attention to its interesting structure. In all the Geasters the peridium is composed of three layers, of which the innermost becomes the receptacle for the spores. In most species the two outer layers remain connected, but split into triangular segments, which spread and produce the star-like pattern that suggested their names. In the present species the segments curve downwards, their tips resting on the soil, whilst the urn-shaped spore receptacle is lifted up on a vaulted arch. A colony of the plants was found by Mr. Lowther, on the occasion of the Fungus Foray on October 4th. Specimens forwarded to Mr. Carlton Rea, per Mr. Swanton, had been identified as *G. minimus*.

Mr. A. A. W. Buckstone reported that he had recently seen a rhododendron in flower for the second time this year at Netley Heath.

Capt. Crocker exhibited a long series of the Royston forms of *Polyommatus* (*Agriades*) *coridon*, and pointed out a remarkable female specimen, of which the abdomen was fully clothed with distinctly blue hairs. He also showed a *P.* (*A.*) *thetis*, from Folkestone, of which the forewing on the underside was ab. *obsoleta*, and on the hindwing underside was ab. *striata*.

OCTOBER 23rd, 1924.

The PRESIDENT in the Chair.

The following were elected members:—Sir Charles Langham, Bart., F.E.S., of Tempo Manor, Co. Fermanagh; Messrs. J. J. Lister, M.A., F.R.S., F.E.S., Grantchester, Cambridge; F. Atkinson, Wandsworth, S.W.; C. N. Hawkins, Upper Tooting, S.W.; K. P. Keywood, Twickenham; and W. H. Storey, Burton Street, W.C.

Mr. A. E. Tonge exhibited a specimen of *Manduca atropos*, from Deal; and reported a further specimen. The President said that several specimens had been reported to him from E. Kent.

Mr. Enefer exhibited sprays of Michaelmas Daisy showing abnormal growths. He also showed a portion of a fossil plant (*Sigillaria*) found in coal; and contributed the following note:—

"A FOSSIL PLANT OF THE CARBONIFEROUS SYSTEM.—*Sigillaria* is one of the plants which aided in the formation of coal. It occurs in the form of compressed stems, attaining a height of 40 to 50 feet, and a breadth of five feet.

"The stems are fluted longitudinally, and marked at regular intervals by single or double scars, the remains of leaf insertions. The *Sigillaria* have been regarded in the past as allied to *Coniferae*; they are now regarded as more closely related to the humble *Selaginellae*. Plants of this description have been found to predominate in the middle and superior beds of the coal formation. An old author (King) says, that if in imagination we delineate a channelled stem of any height between 12 and 100 feet, crowned with a pendant fern-like foliage, furnished with wide-spreading thickly fibrilled roots, and growing in some densely wooded swamps of an ancient Mississippi, we will then have formed a tolerably close restoration of a *Sigillaria* vegetating in its true habitat."

Mr. Hy. J. Turner exhibited a large number of species of Lepidoptera from the neighbourhood of Rio de Janeiro, sent by Mr. F. Lindeman, our fellow member. Among the species were *Papilio ascanius*, *P. dardanus*, *P. crassus*, *P. polystictus*, *P. polydamas*, *Hypna clytemnestra* var. *huebneri*, *Opsiphanes quiteria*, *Taygetis andromeda* race *cleopatra*, *Lycorea halia*, *Heterosais nephele* race *edessa*, etc.

Capt. Crocker exhibited a large number of *Melitaea aurinia* bred from Dorset larvae, including a number of extreme variations, of which last year, in a similar breeding, he had obtained but few. Also, he showed a *Hamearis lucina*, just bred from a spring larva, with pupae which apparently were normally going over the winter.

Mr. R. Adkin read the following as a correction to his paper read last year, and published in the "Proceedings" for 1923-4, pp. 55-62.

Diacrisia lutea, Hufn., var. *unicolor*, Homberg, a correction.—In a paper which I read before the Society about a year ago, I said that I was not aware that any forms that would pass for var. *unicolor*, Homb. = *denigrata*, Schultz, had occurred in this country ("Proc.," 1923-4, p. 62). My friend, Mr. G. T. Porritt, now informs me that he has in his collection four specimens that exactly agree with the description of these forms. He obtained them from the Sydney Webb collection; one of them is labelled "Ex. C. S. Gregson Coll.," the other three have no further data, but have the appearance of old British specimens. Also that he has two Huddersfield specimens that agree very closely.

Capt. J. Ramsbottom, M.A., gave a lantern lecture on "Fungi," which he illustrated with a number of exceedingly well executed slides, which included types of the principal groups, with a more extensive representation of the Agarics.

NOVEMBER 13th, 1924.

The President in the Chair.

Miss F. E. Bird, of Streatham, was elected a member.

Mr. A. E. Tonge exhibited a specimen of *Euvanessa antiopa*, taken by a gardener in Reigate this autumn.

Mr. E. J. Bunnett exhibited series of the Coleoptera *Endomychus coccineus* and *Pyropterus* (*Eros*) *affinis*, from Surrey, and *Dibolia cynoglossi*, from its only known locality (Sussex). He also showed the shells of the fresh-water mollusc, *Littorina rudis* var. *variabilis*, from its only known locality in Sussex.

Mr. K. G. Blair, on behalf of Mr. A. M. Stewart, of Paisley, exhibited a specimen of the cockroach, *Blabera cubensis*, Sauss., a native of the West Indies, imported with bananas.

Accompanying the specimen was an egg mass deposited by it when placed in a cyanide bottle. The usual enclosing capsule is very flimsy, so that the eggs, 42 in number, in two rows side by side, appear almost to be unenclosed by any capsule. It is not certain whether this is normally the case, as it may be due to the circumstances in which the eggs were deposited before the secretion of the capsule was complete. [vide *Ent.* LVIII. 57 (1925).]

Mr. Hy. J. Turner exhibited a box of Lepidoptera, mainly butterflies, from Chili, including fine series of *Papilio archidamas* (*bias*), *Tatochila autodice*, the common Pierid, *Colias vautieri*, *Pyrameis carye*, the representative of *P. cardui*, *Dione vanillae*, with wide silver stripes below, etc.

Mr. A. A. W. Buckstone exhibited some heavily marked ♀ *Pieris napi*, from Chiddingfold, the veins of the hindwings being exceptionally well marked in one specimen; they were of the summer brood.

Mr. H. W. Andrews exhibited species of the Dipterous genera *Gastrophilus*, *Hypoderma*, *Lucilia*, *Cephenomyia*, *Oestrus*, *Fannia*, *Malophagus*, *Hippobosca*, and *Ornithomyia*, to illustrate the first part of his paper on "Flies and Disease." (See page 45.)

NOVEMBER 27th, 1924.

Annual Exhibition of Varieties.

The President in the Chair.

A very large number of members and their friends were present, nearly 140 signed the attendance book. The exhibits were not passed around as was the custom in previous years, but after presentation, with remarks, to the President were arranged on side tables; with the result that those present had ample time and opportunity to inspect what was on view. This innovation on the part of the Council was very generally approved, and will no doubt be repeated on future occasions.

On behalf of Lord Rothschild, Dr. Karl Jordan exhibited (1) three examples of the Small Crested-Lark, *Galerida theklae*, Sharpe, to illustrate three of the local races of this bird found in Algeria, *viz.*, the dark race of the coastal region, or Tell, *G. theklae* race *harterti*, Erlang.; the race from the steppe region of the Hauts Plateaux, *G. theklae* race *hilgerti*, Hart.; and the race from the sandy portions of the Sahara Desert, *G. theklae* race *deichleri*, Erlang. These three races show clearly the influence of their surroundings, as they have assumed the colour of the soil they live on. The little bottles attached to the legs contained samples of the soil on which the specimens were shot. They were collected by Lord Rothschild and Dr. Hartert.

(2) The series of *Lasiocampa quercûs*, Linn., in Lord Rothschild's British Collection; and drew especial attention to the var. et ab. *roboris*, Schr., which occurs only as a rare aberration in England, whereas in Spain and Portugal it is the normal local race; also a female with male coloration, a dark sooty-brown female, a pure yellow female, and two males in female coloration were pointed out as being of particular interest.

(3) The British series of *Cosmotriche* (*Odonestis*) *potatoria*, L., which contained many specimens of the usual light and dark forms in both sexes, with five pure yellow males, seven pure yellow females, two pure white females, and four females in the dark male coloration. He also called attention to a larva mounted sideways, showing an extra proleg protruding from one of the spiracles.

(4) His British series of *Dianthoecia carpophaga*, Bork., showing every intergradation between the typical dark inland race and the ab. and var. *ochracea*, Haw., of the sea coast; he drew special attention to the half row of ab. *ochracea*, which exhibited the most extreme form, cream-white with only the reniform and orbicular stigmata outlined in dark.

It was further pointed out, in regard to the last three series, that Lord Rothschild in his British collection made a point of including in the series, wherever possible, the larva in all stages, pupa, specimens of the imago set in a position at rest, and the Dipterous and Hymenopterous parasites.

Capt. N. D. Riley, exhibited a small selection of Rhopalocera collected by Major Kingston, whilst on the 1924 expedition to Mt. Everest. They included the rare *Parnassius hanningtoni*, *P. simo* race *acconus*, *P. acco*, *Baltia butleri* race *sikkima*, *Colias berytha*, and two very distinctly different races of *Papilio machaon* race *sikkimensis*, from the southern slopes of the Himalayas, and race *montanus* from the northern slopes. Also the three Vanessids of the *Vanessa* (*Aglais*) *urticae* group, *A. chinensis*, *A. ladakensis*, and *A.*

caschmirensis; and called attention to the occurrence of these three species in the same area.

Mr. W. J. Lucas exhibited the very uncommon Neuropteron, *Drepanepteryx phalaenoides*, taken by Mr. T. M. Blackman, at Witherslack, Westmorland, on May 17th, 1924, with a specimen of the moth *Drepana lacertula*, to show the great similarity in shape, colour and pattern.

Mr. G. Talbot exhibited, on behalf of Mr. J. J. Joicey, a long series of the forms of the Nymphaline genus *Phyciodes* (*Eresia*) with mimetic patterns, together with butterflies of other groups associated with them. The mimetic forms were divided into thirteen groups, and these groups were represented by forms of Ithomiinae, Actinote, Eueides, Heliconius, Erycinidae, Pieridae, and a Dioptid moth. Gp. 1. Orange or red patches and bars, *e.g.*, *Actinote eresia* and *Phyciodes actinotina*, etc. Yellow bars and patches, *e.g.*, *A. radiata* and *P. rosina*, etc. Gp. 2. Cream-banded forewing and reddish-rayed hindwing, *e.g.*, *Eueides eanes* race *eanides* and *P. perilla*, etc. Gp. 3. Both wings with broad brown band, *e.g.*, *E. aliphera* and *P. bella*, etc. Forewings with white apical spots, *e.g.*, *E. olympia* and *P. emerantia*, etc. Gp. 4. Wings banded with brown and yellow, *e.g.*, *E. dianassa* and *P. eunice*. Gp. 5. Ditto with narrow bands, *e.g.*, *E. cleobana* var. *zorkaon* and *P. philyra*. Gp. 6. Both wings with brown and black bands and spots, *e.g.*, *Melinaea phasiana* and *P. murena*, etc. Forewing yellow band, *e.g.*, *Ceratinia mamercus* and *P. quintilla*, etc. Forewing with yellow apical spots, *e.g.*, *C. manaos* and *P. murena* f. *heliconina*, etc. Gp. 7. Forewing brown with broad black apex, hindwing black with brown apical patch or bands, *e.g.*, *C. seminigra* and *P. pardalina* form, etc. Gp. 8. Forewing black with white spots, hindwing brown, *e.g.*, *Hyposcada adelphina* and *P. poecilina*, etc. Ditto with forewing brown base, *e.g.*, *H. virginiana* and *P. margaretha*, etc. Gp. 9. Wings black with yellow spots, hindwing with brown inner patch, *e.g.*, *Napeogenes peridia* and *P. ithomioides*, etc. Gp. 10. Forewing with reddish brown band, hindwing with yellow band, *e.g.*, *Heliconius beskei* and *P. langsdorfi*, etc. Gp. 11. Wings more or less diaphanous with black or yellowish scaling. Both wings with black white-dotted margins, *e.g.*, *Ceratinia antea* and *P. moesta*, etc. Hindwing with brown patch on inner margin, *e.g.*, *C. oena* and *P. ildica* f. *fassli*, etc. Forewing with dark band, hindwing yellowish, *e.g.*, *Eueides edias* r. *eurysaces* and *P. letitia*, etc. Gp. 12. Forewing with white bars, hindwing with white band, *e.g.*, *Leucothyris* *dolabella* and *P. nauplia* var. *plagiata*, etc. Gp. 13. Forewing with yellowish discal band, hindwing with brown band, *e.g.*, *Eueides procula* and *P. margaretha*, etc. The chief area for the occurrence of this mimetism was the Upper Amazon, Ecuador, Peru, and Colombia, and less numerous in other parts of tropical America. The models are species of *Actinote*, *Eueides*, *Heliconius*, *Ithomia*, *Melinaea*, *Ceratinia*, *Mechanitis*, *Hyposcada*, *Protogonius*, *Napeogenes*, *Callithomia*, *Hirsutis*, *Leucothyris*, etc. The mimics are species of *Phyciodes*, a few Erycinids, Dioptid moths, *Vila*, *Dione*, *Charonias*, etc.

Mr. Robert Adkin exhibited series of mongrel *Diacrisia mendica*, obtained by re-crossing the mongrel race *mistura* ("Proc." 1922, p. 126) with typical *mendica*. In this re-crossed race, for which he proposed the name *bimista*, the pale veining and fringes so noticeable in the males of the race *mistura* ("Proc." 1923, p. 127) were much less strongly pronounced, but many of them retained the pale grey tone of colour, and a few were rather heavily spotted; the proportion of dark males was, however, somewhat larger than in the broods of *mistura*.

He also exhibited the following varietal forms.—*Aglais urticae* closely resembling var. *polaris*, "in that the colour was somewhat darker and the black blotches larger than in typical *urticae*, a broad black streak along the costa, the uniting of the median-costal and inner-marginal blotches by a dark shade (not by a distinct black band as in var. *connexa*,) and the absence of the blue in the marginal lunules of the upper wings"; the specimen was reared from a batch of larvae collected in East Sussex; one or two others resembled it in some of the characters, but the remainder of the brood were normal. A specimen of *Pyrameis atalanta* in which the red band was crossed by two well marked black stripes. An underside of *Polyommatus icarus* with "obsolete" forewings. Specimens of *Zygaena filipendulae* with malformed spots and one with *achilleae*-like markings. *Eupithecia satyrata* with well marked striae across all four wings. All captured or bred in the neighbourhood of Eastbourne during the present year. Also a specimen of that sporadic species, *Margarodes unionalis*, taken at ivy blossom near Eastbourne on October 13th last.

Mr. R. Armstrong Adkin sent for exhibition a sinistral specimen of *Helix aspersa*, which he found within the limits of the town of Eastbourne during the past summer. Also several shells of *Helix heripensis*, a species that has been differentiated since the majority of text-books now in use were published; together with examples of the nearly allied *H. caperata*; from which, it was pointed out, it differed in many minor details and particularly, when alive, in the darker colour of the animal, and in the more open unbilicus of the shell. Both species were to be found commonly in many places on the South Downs, often occurring together.

Messrs. A. de B. and O. R. Goodman exhibited :—1. A case of butterflies from Corsica, taken in July, 1924, including the local forms of most species indigenous to the island at that time of the year. *Dryas paphia* ab. *anargyra*, *D. pandora*, *Argynnis elisa*, *Satyrus circe*, *Aglais urticae* race *ichnusa*, *Colias croceus* ab. *pupillata*, *Leptosia sinapis*, *Epinephele ida*, *Hipparchia neomiris*, *H. semele* race *aristaeus*, *Epinephele megera* race *tigelius*, *Coenonympha corinna*, *Rumicia* (*Heodes*) *phlaeas*, *Plebeius argus* (*aegon*) race *corsica*, *P. argyrognomon* and *Hesperia therapne*.

2. Butterflies of the family *Satyridae* from Digne, Basse Alpes, France, July, 1924. *Satyrus hermione*, *S. circe*, *S. statilinus*, *S. fidia*, *S. cordula*, *Hipparchia briseis*, *H. semele*, *H. arethusa*, *Pararge megera* and *Epinephele lycaon*.

Mr. H. A. Leeds exhibited the following aberrations, all captured during 1924.

Epinephele jurtina :— ♂ upperside with small ocelli on each hindwing, in same position as ocelli in ♂ *H. semele*; ♂ underside, much paler ground, central area, forewings straw coloured and apical spots very small; ♀ underside, heavily spotted apical and two beneath on forewings and four on hindwings, all very striking in blackness and size.

Hipparchia semele.— ♂ uppersides, two strongly contrasting, one with forewings almost unicolorous, and the other broadly banded on fore- and hindwings with stone colour.

Coenonympha pamphilus.— ♂ underside without apical ocelli on forewings; ♀ underside without apical ocelli on left forewing, and only just discernible on right forewing; ♂ underside, all wings very dark.

Polyommatus icarus.— ♂ upperside, very brilliant blue; ♂ underside, left hindwing ground white and smooth as if enamelled between nervures, other wings normal; ♀ underside, *postica-discreta* (Tutt) + anticoradiata (C.).

Plebeius medon. — ♀ underside, postico-sinistro-paucipuncta, -caeca (C.).

Plebeius argus (*aegon*).— ♂ upperside, all nervures white; ♂

upperside, broad whitish band, on blue, interior to outer black border of forewings; ♂ upperside, whitish markings on outer borders of forewings, similar to *coridon* ab. *fowleri*; ♀ upperside, *albo-marginatus*; ♀ upperside, right forewing with many khaki streaks; ♀ upperside, left wings, gynandromorphous, well streaked; ♀ underside, paucipuncta (C.); ♀ underside, unipuncta (C.).

Polyommatus coridon:—♂ uppersides:—(1) Very broad black border on hindwings; (2 & 3) *fowleri.*

♀ uppersides:—(1) Khaki ground colour; (2) *atrescens-albicincta* + whitish wedges on hindwings interior to border; (3) *atrescens-basicaeruleata*; (4) *atrescens-albicincta* + whitish wedges on all wings interior to border thence blue streaked between veins to base, no orange lunules, and hindwings with white circles as in ♂ ab. *cincta.*

♂ undersides:—(1) arcuata-antico-pluripuncta-discoelongata (C.); (2) radiata (C.); (3) postico-discoelongata (C.).

♀ undersides:—(1) centrijuncta (C.) + *anticojuncta* (Tutt); (2) anticojuncta; (3) bi-I-nigrum-anticojuncta; (4) glomerata-I-nigrum + confluens; (5) semiarcuata-anticojuncta; (6) additional straight black line above bi-I-nigrum + bibasijuncta; (7 & 8) caeca (C.), both with forewings whitish and the hindwings of one olive-brown; (9) anticoradiata (C.); (10) *pallida* (Tutt) + postico-parvipuncta (C.); (11) all usually white portions including rings and fringes pale-buff coloured; (12) pallida-chlorescens-dextrosemi-I-nigrum,-sinistro-I-nigrum; (13) anticopaucipuncta-posticocaeca (C.); (14) forewings whitish, hindwings olive-brown + rufescens-crassipuncta; (15) *pallida* (Tutt) + posticopaucipuncta (C.); (16 & 17) paucipuncta (C.); (18) *anticodiscreta* (Tutt) + postico-paucipuncta (C.).

[(C.) = Courvoisier's descriptive terms in Vorbrodt's "Die Schmetterlinge der Schweiz," Bern, 1922.]

Col. R. H. Rattray exhibited a few butterflies from Equatorial Africa sent by his son, Capt. F. Moysey, showing mould on wings, which was on them while alive. The original notes by Capt. Moysey, made at the time of capture, were attached.

He also showed aberrations of *Plebeius argus*, Linn. (*aegon*). A female almost blackish in colour with but little trace of orange lunules, and with a series of deep blue wedges on the hindwings; an underside with costal spots on the underwing joined (ab. *costa-juncta*) and the other spots irregularly mixed up and very close together; an underside with very large extended spots; an underside female (ab. *unipuncta*), with distinct spots between discal spot and base of upperwing; two undersides, females (ab. *approximata-juncta*), with the black marginal series of lunules extended towards the row of spots nearly, and in many cases quite meeting.

Mr. A. A. W. Buckstone exhibited bleached forms of *Aphantopus hyperantus* and of *Epinephele tithonus*, from Surrey; a very dark example of *Pararge megera*, from Ascot, Berks, August, 1915; a pale straw-coloured specimen of the same species from Box Hill, in August, 1921; an underside of *Pieris brassicae*, with black scales between the two large spots of both forewings, from Chiddingfold, in August, 1922; melanic forms of *Tephrosia crepuscularia*, from Mickleham, Surrey, where this form is greatly on the increase; a bred series of *Pseudoterpna pruinata*, from Wimbledon larvae, including a number of dark-banded females; a series of *Rumicia* (*Heodes*) *phlaeas*, bred from ova from Wimbledon, in 1924, varying from yellowish ground to dark red; a varied set of the same species captured at the same place, in August, 1924, including dark smoky forms, a golden one with dark shading, one with the inner margin of the left forewing and the outer third of the wing white, and an unusually large female of a yellowish colour; also varied undersides of *A. hyperantus*, from Surrey and Queenstown, Ireland.

Mr. J. W. Cox exhibited *Aglais urticae* ab. *polaris* and four pink-tinged specimens; *Colias croceus* ab. *helice*; *Polyommatus icarus* ab. *clara*; *Abraxas grossulariata* ab. *lacticolor*; and three confluent examples of *Zygaena trifolii*.

Mr. C. Craufurd exhibited, on behalf of Mr. Frank Stevens, a most remarkable underside aberration of *Ruralis betulae*. It was bred from a larva beaten at Chiddingfold, Surrey, where the species is somewhat numerous. It is an unusually large male, the upperside is almost normal, showing only what appears to be a faint bleaching of a small area on the forewings. The ground colour of the undersides is duller than in ordinary ♂ s, and there is less contrast of colour. There is a total absence of red in the marginal area. The black spot of the anal angle of the hindwing is not accompanied by the red areas, although the white edging is present. The usual narrow, shaded, submarginal band of all the wings is here an irregular blackish band, still darker in the hindwing. The ground of the whole hindwing is that of the usual central band; that of the forewing is of two quite distinct shades on the costa, but gradually approaching one another in shade towards the inner margin, where they assimilate, there being there no line to separate them as there is towards the costa. The conspicuous, white, black-edged, transverse line from just below the costa is totally absent, and thus there is no elongated inverted triangle, suspended, as it were, below the costa, forming one of the obtrusive recognition marks of the species. There is no trace of the usual, conspicuous, long, white, black-edged, wavy transverse line on the hindwing. Thus, as in the forewing, there is no band on the hindwing, and another strong recognition feature is missing (Plate VIII.).

Mr. Douglas H. Pearson exhibited a very varied collection of the extreme forms of *Abraxas grossulariata* consisting of 2 rows from wild larvae, Chilwell, 1924, including ab. *subviolacea* and ab. *albipalliata*; 9 asymmetrical specimens; and the following inbred aberrations *hazeleighensis, axantha, lutea, lutea-infrabifasciata, semi-lutea, infrabifasciata, infrafasciata, fulvapicta, radiata, nigrolutea, lacticolor-centralipuncta, lacticolor-nigrocostata-radiata, nigrosparsata, varleyata, actinota, eremodisca, exquisita, exquiseta-aenea, pulchra, xantha, crocea, fractifasciata, nigrocretacea, nigrolineata*, and *melanozona;* also the following Rhopalocera from Provence, mainly from Ste. Baume. *Hipparchia semele, H. arethusa*, from almost no trace of the yellow marking to specimens strongly marked, *Satyrus statilinus, S. fidia, S. hermione* (*major*), *Leptosia duponcheli* (2nd brood), dwarf *Pieris rapae*, dwarf *Pontia daplidice, Epinephele ida*, 2 dark suffused *Melanargia galathea, Coenonympha pamphilus* race *lyllus, Libythea celtis*, bleached *Argynnis niobe, Melitaea didyma, M. phoebe, Polyommatus dolus, P. icarus, P.* (*Agriades*) *thersites, Hesperia sao, Pyrgus proto, Erynnis alceae* and *E. lavatherae* (small).

Mr. Jacques exhibited two extreme, bred specimens of *Hyloicus pinastri*, the one very light, of a dirty cream colour, and the other suffused with black; together with *Callimorpha quadripunctaria* (*hera*) bred from larvae.

Mr. and Mrs. S. G. Castle Russell showed the following aberrations of British Rhopalocera, all captured or bred by the exhibitors during the past season.

Melitaea aurinia.—A specimen with upperwings nearly completely suffused with deep black, and the underside heavily striated with black.

A specimen somewhat similar, but the forewings less suffused with black, the underside being spotless, with a broad cream coloured marginal band at base of hindwings.

A specimen with the ground colouring of a light claret tint, with long pearly grey rays on upperwings. Hindwings nearly black

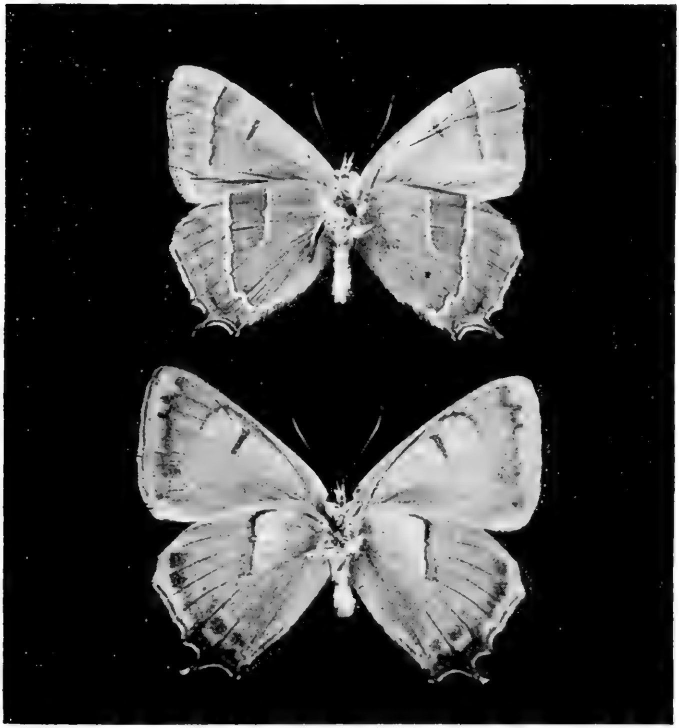


Photo A. E. Tonge.

RURALIS BETULAE AB.

To face page 122.

with the marginal spots lengthened into white rays. Underside entirely spotless, with wide cream marginal band on lower wing.

A specimen with fulvous ground colour, and suffused black markings with absence of yellow markings. Underside normal except for 4 large black spots close to inner margin of each forewing.

All above bred from Hampshire parents and reared under normal conditions.

Aphantopus hyperantus.—An extreme form of ab. *lanceolata*, male, New Forest, July, 1924. A specimen with large symmetrical, buff coloured splashes on each hindwing.

Polyommatus icarus.—A gynandromorph with left upperwing entirely of male colour, the remaining three wings being of female colour (brown) with slight dashes of male colour on each; Andover District, August, 1924.

Coenonympha pamphilus.—A female with the two forewings on the upperside nearly all white or cream colour, the lower wings being of normal colouring; Andover District, August, 1924.

Rev. R. E. E. Frampton exhibited a large Orthopteron from St. Vincent, West Indies, for which he sought identification. Locally, he said, it was known as the "Shok-shok," from its stridulation producing a loud, sharp noise resembling the impact of two large stones struck together twice. Subsequently, in the conversazione, it was pointed out to Mr. Frampton that the same insect was described by Bates ("Amazons") under the native name of Tananá (*Chlorocoelus tananá*), and its notes as the loudest and most extraordinary he had ever heard produced by an orthopteron. Darwin reproduced Bate's admirable figure in his *Descent of Man*. It is now known as *Thliboscelus camellifolia.*

Mr. H. Worsley-Wood exhibited a cabinet drawer of *Mellinia* (*Xanthia*) *ocellaris*, caught or bred from wild parents 1911-1923.

Mr. A. W. Mera exhibited a series of the second brood of *Boarmia roboraria*, bred in 1924 from a melanic female taken in West Essex. Five of the larvae outstripped all the others, and the imagines emerged the same year.

Capt. W. Crocker exhibited for Mr. Percy Richards varied series of *Aglais urticae, Argynnis aglaia* and *Rumicia phlaeas*, the latter including a remarkably black form.

Mr. Hy. J. Turner exhibited a number of Palaearctic Rhopalocera, taken mainly in the elevated region of Western China—several of the *Papilio tamerlanus* group *mandarinus, eurous, parus*; the Pierids, *Aporia bieti, A. davidina, Metaporia lotis, M. goutelli, M. genestieri,* *M. delavayi*, *M. lhamo* and *Synchloë dubernardi*; the Parnassiids *P. imperator*, *P. epaphus* r. *poeta*, *P. orleans* and *P. jacquemontii* ab. *tatsienluica*; *Armandia thaidina*; *Apatura iris* r. *bieti*; together with *Dryas paphia* race *dives* from Algeria and several species of the genus *Catocala* including *C. largetaui* from Ta-tsien-lou and ab. *rosea* of *C. puerpera*.

Mr. W. Rait-Smith exhibited a number of fine aberrative specimens and contributed the following note.—" My exhibit consists principally of some of the Lepidoptera which were collected, on my behalf, during the summer of 1924 by Mr. L. A. E. Sabine in the extreme North-West of Ireland, *viz*:—the Belmullet district of Co. Mayo. 1. A series of *Epinephele jurtina*, some of these are very near the form *hispulla*, Hb. 2. A series of *Polyommatus icarus*. In one specimen the usual red lunules are replaced by yellow; this is rare in the Irish form of *icarus*. 3. A series of extreme aberrations of *Polyommatus* (*Agriades*) *coridon*: included amongst these is a specimen of the extremely rare ab. *obsoletissima*, from Royston. 4. *Vanessa io* ab. *belisaria*, bred from a Kent larva. 5. *Aphantopus hyperantus* ab. *obsoleta*, bred from a Blean Wood larva. 6. *Pyrameis atalanta*, an extreme aberration in which the red band is greatly extended. This was bred from an Eastbourne larva. 7. *Epinephele jurtina*, a gynandromorph, left side ♀, right side ♂. There is at least one, possibly two European examples of this hermaphrodite known, but as far as I know this specimen, taken by Mr. Sabine on July 22nd, 1924, in Co. Mayo, is the only British specimen. 8. *Leptosia sinapis* a gynandromorph. This specimen was bred on May 17th, 1924, from a ♀ taken in the Cranleigh district of Surrey last year. I do not know of another gynandromorph of this species. 9. *Polyommatus icarus*, an extremely blue ♀ and a heavily radiated example from Folkestone. 10. *Heodes* (*Rumicia*) *phlaeas*. Two specimens of the ab. *radiata*, one ab. *alba*, and one in which the right side is typical and the left approaches ab. *schmidtii*.

Mr. T. A. M. Nash exhibited a specimen of *P. cardui* with blue centres to the marginal spots.

Miss Irma Anderson, a student of the John Innes Horticultural Institution, exhibited plants raised under critical conditions illustrating Mendelian segregation in Ferns. From *Polystichum angulare*, variegated, of approximately normal shape, had been raised a large family having at least six distinct forms, probably representing the combination of two pairs of factors. Each combination had appeared both in the green and the variegated condition. In *Athyrium filix-foemina* specimens were shown from a family similarly illustrating segregation in respect of frond-form. Experiments with variegated *Scolopendrium* had shown that from any single sporangium, the spores gave rise exclusively either to all green, or to all pale prothallia.

Mr. A. E. Tonge exhibited an *Argynnis aglaia* ♂ with symmetrically bleached areas on the hindwings, Reigate ; *Plebeius* (*Aricia*) *medon* ♂ ab. *obsoleta* from Deal; and of *Polyommatus coridon*, ab. *cinnamoneus* ♂, ab. *grisea* ♂, ab. *obsoleta* 3 ♂s and 1 ♀ from Herts and Kent.

Mr. C. H. Williams, a series of aberrations of *P. coridon*, including a black form of the male.

Mr. L. W. Newman exhibited the following—1. A long series of *Abraxas grossulariata* showing extreme forms of ab. *varleyata*, and of the Aberdeen race. 2. A series of *Aglais urticae*, bred from wild larvae, showing no really striking ab. though the series was picked from over 20,000 specimens. 3. A series of *Pyrameis atalanta*, bred from over 10,000 wild larvae, the variation being very small with the exception of one dark underside. 4. A series of *Pachys betularia*, mostly wild caught in the North London District showing great variation and a good percentage of fine intermediate forms between the type and the black ab. 5. A *Callimorpha dominula* with fore-wing almost entirely black and hindwing banded. 6. *Demas coryli*, a series of typical and melanic specimens from the Chiltern Hills, Bucks.

Mr. W. E. Sharp exhibited a long series of *Cosmotriche potatoria* from the Eastbourne district, showing considerable colour variation.

Mr. W. Gifford Nash exhibited leaden-coloured males and females of *Polyommatus* (*Agriades*) *coridon* ; a series of underside aberrations and several ab. *inequalis* of the same ; *Plebius* (*Aricia*) *medon* an ab. *obsoleta* ; and a quite fresh specimen of *Deiopeia pulchella*, taken at Bedford on May 29th, 1924.

Mr. C. Priest, exhibited a cabinet drawer containing series of the British Vanessids including 2 *Euvanessa antiopa*, with *Apatura iris*.

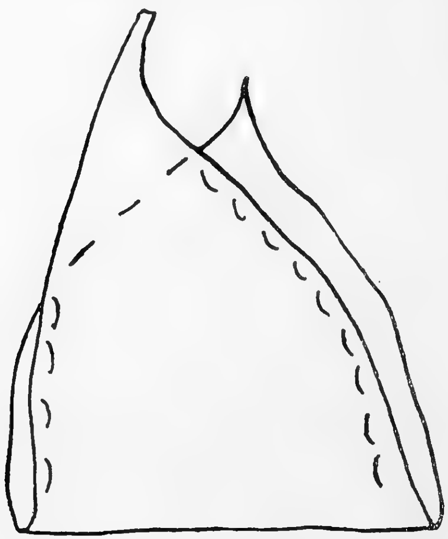
Mr. E. J. Bedford exhibited a water-colour drawing and two photographs, executed by himself, showing upper and underside of a var. of *Argynnis cydippe* (*adippe*), taken in East Sussex in 1922.

DECEMBER 11th, 1924.

The PRESIDENT in the Chair.

Messrs. Hans Leonhardt, of 45, Redcliffe Gardens, S.W.; and J. F. Grant, of 37, Old Road West, Gravesend, were elected members.

The President read the following notes on *Ornithoptera titan*, which he had received from Mr. C. M. Woodford.—"I notice in this month's "Entomologist" that you exhibited a pair of the rare *Ornithoptera titan* from Papua at a recent meeting of the South London Entomological Society, and stated that the male had been brought to the collector wrapped in leaves. It has recalled to me the fact that I believe I was the means of receiving the first male sent to England. During one of my visits to Sydney from the Solomon Islands, I was offered a small box of insects in papers which had been found among the effects of a deceased trader in Papua, locality unknown, but I believe somewhere towards the S.E. end. I had the box sent to the late Henley Grose Smith without examining it, and it was found to contain, among a lot of rubbish,



Leaf of *Barringtonia* sp. folded and edges pinned together with midrib of leaves of a palm. Much reduced from size of original leaf which is actually about 12 inches in length by 5 in width.

one male of *O. titan*. Grose Smith, as you know, figured it in the third volume of his "Rhopalocera Exotica."

"When I was collecting in the Solomons in 1886-9, my native collectors frequently brought me butterflies wrapped in leaves. In fact, although I supplied the more intelligent of them with papers, they preferred to use leaves, and used to bring me such things as *O. victoria* ♂ and Papilios so wrapped in the most perfect condition. The leaf mostly used was that of a species of *Barringtonia*, a large fleshy leaf with the shiny surface of a laurel leaf. They folded the leaf in two and fastened it with pins made from the midrib of the leaves of a palm in the manner roughly indicated on the back of this."

Mr. Couchman exhibited an aberrant Noctuid, which was thought to be *Hadena trifolii* (*chenopodii*).

Mr. Hy. J. Turner exhibited the following series of *Thera* (*Larentia*) *variata* and of *T. obeliscata* with many of their local forms and aberrations.

A choice selection of specimens kindly lent by M. René Oberthur at the instance of Herr Carl Höfer consisting of—1. *T. variata* from the woods near Vienna, hence probably typical of those used by Schiffermüller when making the "Verzeichniss" in 1776. The form of grey appearance with a very slight suggestion of brown. 2. Specimens of a dark form from the same locality, which form Staudinger had included in his *scotica*, described from the dark Scotch forms. The Vienna dark forms were quite different and were now named *obscura* by Höfer. 3. Several ab. *scotica* from Paisley for comparison. 4. An albino form. The specimen had a semitransparent appearance, although all markings were relatively clear and definable. 5. ab. *albonigrata* Höfer. A form with white ground and dark markings without any being suppressed. 6. Brown forms of *variata*, bred *ex ovo* from a common grey *variata*; the larvae fed on spruce, *Picea excelsa*. 7. Specimens of a form which has a light fulvous ground with well emphasised band and which has been considered as the form named *fulvata* by Fabricius. 8. Specimens of *T. variolata*, Stdgr., an allied species from Algeria. 9. A fine series of the rare aberration *stragulata*, Hüb., figured so clearly by Hübner in his "Sammlung," 337. Five of this series were the historic specimens from the cabinet of M. Guenée, two of which had previously been in the collection of M. Bellier de Chavignerie. The others were from Klosterneuenburg near Vienna and from the Pyrenees. The ground of these was of a delicate greenish white with more or less obsolescence of the band, otherwise very well marked. 10. A specimen of *obeliscata*, Hb., a facsimile with the figures of Hübner in his "Beiträge" I. 2 plt. 1. C. (1787) and "Samml," 296. 11. A series of the *obeliscata* form facsimile of that figured as such by Herrich-Schäffer, "Sys-Bearb." figs. 240-2, which very closely resembles the species *T. firmata*. They were also from the Vienna Woods. This form has been named *herrichi* by Höfer. 12. A variable series of British *variata* bred from larvae obtained and fed on spruce near Southampton by Mr. Wm. Fassnidge. They were all of a peculiar grey coloration and quite separable in tone of colour from the Vienna and continental forms exhibited. Subsequently, when shown to Mr. Prout, he expressed the opinion that they were apparently quite racial and might be named. (These were described and named race *britannica* in the "Ent. Record," 1925, p. 25). There were two very pale, semitransparent examples. 13. A specimen of *obeliscata* bred from *Pinus sylvestris*, from Westerham, which was grey in coloration and very closely resembled one of the above *variata*. 14. A series of *obeliscata* bred and captured from various localities in England, including a specimen like H.-S's. figure *herrichi*, Höfer, and another like Hüb's. figure *obeliscata*, and an aberrant example practically without any markings except a faint change of shade where the transverse band usually lies. All these specimens were of a definite and consistent shade of brown and nothing approaching the grey of *variata*. 15. A series of figures of several named forms not included in the exhibit, ab. *albonigrata*, Höfer, ab. *costimaculata*, Höfer, ab. *grisescens*, Höfer, ab. *reducta*, Höfer. 16. Drawings of the genitalia of *variata* and *obeliscata* kindly lent by Rev. C. R. N. Burrows, to compare with copies of the drawings made by Mr. F. N. Pierce ("Genitalia of the *Geometridae*.")

Mr. A. A. W. Buckstone exhibited long series of bred and captured specimens of the species from Hampshire, Oxshott, Wimbledon, Chiswick, Paisley, etc., and contributed the following note:—

"*T. obeliscata* is abundant at Oxshott, where I have always found specimens of the autumn brood nearly or quite, as abundant as those of the spring emergence. Larvae beaten out in July and August all emerged as moths in October, none remaining in pupae over the winter.

"The dark form *scotica* is scarce at Oxshott, fairly numerous, locally at Wimbledon, where I have taken but one specimen of *obeliscata*, and that very dark and approaching var. *scotica*. At Chiswick, where I resided for ten years, *scotica* was the only form observed.

"The pale reddish brown forms are frequently mistaken by collectors for *firmata*, which species is stated by most authors to be double-brooded. The larvae, however, which others as well as myself have taken in the early spring (March or April), have not emerged as moths until the following August, September, or October. Although searched for over a number of years, I have not yet found the moth in its wild state earlier than September. Several collectors have informed me that they have taken it in June; but after having seen them I had no difficulty in convincing my correspondents that they were but the reddish form of *obeliscata*. I have had the species under observation for more than twenty years"

One specimen exhibited by Mr. Buckstone had all the usual marking on the forewings absent, with the exception of a dark mark on the costa.

Mr. Turner said that to him the difference between the genitalia of the forms *variata* and *obeliscata* was insignificant as to specific distinction, although in a large number of characters the two appeared to be abundantly separable and separate. He was prepared to take the view that there was a new species in the process of the making, until a sufficiently extensive breeding from the egg and intercrossing had been undertaken.

Others were of opinion that they were undoubtedly two species.

JANUARY 8th, 1925.

The President in the Chair.

Dr. Cockayne exhibited a preserved larvae of *Habrosyne derasa* to shew asymmetry of the spotting:—1. A spot on the 5th segment each side. 2. A spot on the 5th and 6th segments right side, and on the 5th left and a trace on the 6th left side. 3 and 4. Spots on 5th and 6th each side. 5. Spots on 5th, 6th and 7th and a tiny one on 9th on right side, on the 5th and 6th on left side and a very small one on the 7th on the left side.

He also shewed living larvae of *Hepialus humuli* on the root of comfrey, and parasite larvae found in November, 1924.

Mr. Vredenburg exhibited a collection of Coleoptera from Zululand.

Mr. L. W. Newman exhibited aberrations of *Arctia caja*.—1. Forewings mostly dark, hindwings spots joined into band, fringes black. 2. Black veins running through white, or forewings and hindwings interlaced with black veins. 3. Forewings abnormally white.

Mr. Hawkins exhibited aberrations of *Camptogramma bilineata* from Herne Bay, including a strongly banded example with the rest of the forewing without the waved markings except in the basal area, which had traces; two were very dark specimens; another had all the waving much intensified with lighter middle area; etc.

Mr. H. W. Andrews exhibited a number of Diptera lent to him by Dr. Marshall to illustrate his paper on "Flies and Disease," of which he then read the concluding portion and showed a number of lantern slides. (Page 49.)

JANUARY 22nd, 1925.

ANNUAL MEETING.

The PRESIDENT in the Chair.

The Reports of the Council and Treasurer and the Balance Sheet were read and adopted. The following is the List of Officers and Council elected for the year 1925 :—

President, T. H. L. Grosvenor, F.E.S. *Vice-Presidents*, E. A. Cockayne, M.D., M.A., F.E.S., and N. D. Riley, F.Z.S., F.E.S. *Treasurer*, A. E. Tonge, F.E.S., *Librarian*, A. W. Dods. *Curator*, S. R. Ashby, F.E.S. *Assistant Curator*, T. L. Barnett. *Hon. Editor of Proceedings*, Hy. J. Turner, F.E.S. *Hon. Secretaries*, Stanley Edwards, F.L.S., F.Z.S., F.E.S. (Corresponding) and Hy. J. Turner, F.E.S. *Recorder of Attendances*, L. E. Dunster. *Hon. Lanternist*, A. W. Dennis. *Council*, J. H. Adkin, H. W. Andrews, F.E.S., S. A. Blenkarn, F.E.S., E. J. Bunnett, M.A., F. B. Carr, C. Craufurd, A. W. Dennis, E. Step, F.L.S., and H. Worsley-Wood, F.E.S.

The President, N. D. Riley, F.Z.S., F.E.S., read the Annual Address and the new President, T. H. L. Grosvenor, F.E.S., took the chair.

Votes of thanks were passed to the retiring President, Treasurer, other Officers, Council and Auditors, for their services during the past year.

Ordinary Meeting.

Mr. T. H. L. Grosvenor, F.E.S., in the chair.

Mr. L. W. Watts, of Chiselhurst, Mr. J. Davis-Ward of Grange-over-Sands, and Prof. Maxwell Lefroy of the Imperial College of Science were elected members.

Mr. Step exhibited some Indian moths, sent to him by his son, Mr. G. E. Step, from Calcutta, where they had entered the house, attracted by light. They included examples of *Theretra pinastrina*, Mart., *Rhyncholaba acteus*, Cram., *Asota ficus*, F., *Othreis fullonica*, L., and *O. materna*, L.

Mr. Dennis exhibited a spray of Butcher's Broom in fruit from Cambridge. It was remarked to be very unusual to find fruit except in gardens. Mr. Step said that at Bookham Common, where the bushes were abundant, he had found that fruiting-stems were habitually cut. Mr. Goodman said that many years ago near St. Martha's, Guildford, the stems were regularly cut for sale to butchers.

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ARACHNIDA.

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THE ABSTRACT OF PROCEEDINGS

For 1886, 1887, 1888-9 (1 Vol.),
1890-91 (1 Vol.), 1892-3 (1 Vol.),
1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901,
1902, 1903, 1904, 1905, 1906, 1907, 1908, 1909,
1910, 1911, 1912, 1913, 1914, 1915, 1916, 1917,
1918, 1919, 1920, 1921, 1922, and 1923.

Are still in print, and may be had on application to the Librarian.

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1890-91, price 3/6 each; 1892-3, price 3/-;
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1902, price 2/6; 1903, price 2/-; 1904, price 2/-;
1905, price 2/6; 1906, price 2/6; 1907, price 2/6;
1908, price 2/6; 1909, price 5/-; 1910, price 4/6;
1911, price 4/6; 1912, price 4/-; 1913, price 4/-;
1914, price 4/-; 1915, price 5/-; 1916, price 3/6;
1917, price 3/6; 1918, price 4/-; 1919, price 5/-;
1920' price 5/-; 1921, price 5/-; 1922, price 10/6;
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MEETINGS OF THE SOCIETY.

HIBERNIA CHAMBERS, LONDON BRIDGE, S.E.

1925-1926.

1925:—June 11th, 25th; July 9th, 23rd; August 13th, 27th; September 10th, 24th; October 8th, 22nd; November 12th, 26th; December 10th.

1926:—January 14th, 28th; February 11th, 25th; March 11th, 25th; April 8th, 22nd; May 13th, 27th; June 10th, 24th; July 8th, 22nd.

LIBRARY OPEN AT 6.30 p.m., CHAIR TAKEN AT 7 p.m.

Members exhibiting specimens at the Meetings of the Society are requested to be good enough to hand to the Secretary, at the Meeting, a note in writing of the generic and specific names of all specimens exhibited, together with the names of the localities in which such specimens were obtained, and any remarks thereon which the exhibitors have to make. In the absence of such a note in writing the Secretary cannot be responsible for any errors in connection with his report of such exhibits, or for the omission of any reference thereto in the Proceedings.

1923-24

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